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ABSTRACT

Missouri's plastics industry was surveyed to identify tasks, skills, and knowledges necessary for entry into plastics-related occupations. Respondents returned 129 questionnaires. Additional information was received by telephone interviews with cooperating industries and associations. Of responding firms, St. Louis and Kansas City metropolitan areas had the greatest concentration of plastics firms. Women contributed heavily to the labor force of the plastics industry, and there appeared a greater potential for female employment in the industry than is currently realized by those seeking employment in other fields. As a result of automation, the plastics industry was not heavily dependent on the work force for production. From responding plastics firms, 44 percent indicated they employed fewer than 25 employees. Their greatest manpower need was for machine operators where job experience was not a concern. Most employers preferred pre-training of employees through public schools in the following areas: machine operator, types of plastics and their properties, mold making and maintenance, mathematics, colorants, and molecular chemistry. Most firms gave evidence of their needs to increase man-hours of work within the next year. (Appendixes include the survey and a list of plastics firms.) (YLB)

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FINAL RESEARCH REPORT

A STUDY OF THE PLASTICS INDUSTRY IN MISSOURI

RFP 32-131-600-1

CONDUCTED BY
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AT
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June 30, 1982

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CHAPTER 1

INTRODUCTION

Plastics have become an important part of our technological life in a very short period of time. All indications are that the development of plastic materials will continue at an accelerating pace, and will even surpass many of the more traditional industrial materials that have been the foundation of our technology over the years.

In 1868, a young American printer mixed proxylin, made from cotton fibers and nitric acid, with solid camphor. John Wesley Hyatt made celluloid, the first American plastic.¹ Even more important, he started what is today, a multi-billion dollar industry in the United States, the plastic industry.

Introductory Statement. Plastics play a vital role in peace, defense and in war. Plastics is instrumental in the development of the automobile, airplane, missile and communications industries. They made possible the pioneer flights of Lindbergh, Byrd, Shephard and Glenn and the future arbiter and stealth craft technologies. The lifelines of communication; telephone, radio, television, radar, sonar, telestar are based on plastics or electrical insulation and vital

¹The Society of the Plastic Industry, The Story of the Plastics Industry; May 1977, p. 2.

components. The comfort of our homes is increased in countless ways: foam cushions for furniture, upholstery fabrics, carpeting and other flooring materials, protective coverings for the home and industry, and soft light illumination for lighting fixtures. Energy conservation is rapidly becoming dependant on the thermal resistant qualities of plastic materials to make appliances, systems, commercial buildings and home thermal efficiency.

Plastic products, specifically designed for their thermo efficiency, have contributed greatly toward the conserving of energy. The fact that plastics are endowed with some "elements of the proverbial perpetual motion machine" in their manufacture have resulted in more energy saved than is required for the production of these miracle machines.² Plastics products can save energy in all stages of their life cycle. Energy can be saved in the production of plastics products verses production of products of traditional materials.

A case in point; In 1977, the plastic industry produced 15.6 billion plastic closures for all rigid containers. To make these closures from 128 million pounds of plastic required 5.2 trillion BTU's of energy. If the same closures had been made of metal, it would have required 176 million

²The Society of the Plastic Industry, Inc., The Energy Saver; Data prepared by Franklin Associates Ltd., Prairie Village, Kansas.

pounds of metal consuming 7.6 trillion BTU's. Thus, the energy saved by using plastics was 2.4 trillion BTU's or the energy equivalent of 414,000 barrels of crude oil.³

It is estimated that since 1946 the plastics industry has at least doubled, four times, its investments in raw materials plastic plants. Hundreds of millions of dollars are being spent in plastic research for the development of new resins and the improvement of the older resins.⁴ The plastic industry has grown phenomenally since the involvement of the United States in World War II. While it took almost 80 years to produce the first billion pounds of plastic, 15 billion pounds were produced in the next 20 years, and this figure doubled to 30 billion pounds in the following 10 years.⁵ According to statistics compiled by the Society of Plastics Industries, 32 billion pounds of plastic resin were produced in 1978, and 36.6 billion pounds were produced in 1980. (Figure 1)

Projecting the growth of plastics materials use to the beginning of the twenty first century, it is expected that by 2000 A.D., 200 billion pounds of plastic materials will be used annually.⁶

³ Ibid.

⁴ _____, "Materials 1980: The Outlook for Materials, Supplies and Prices." Modern Plastics, pp. 71-108, January 1980.

⁵ Ibid.

⁶ _____, "Resin Report '78", Plastic Engineering, Society of Plastics Engineerings, p. 16, September 1978.

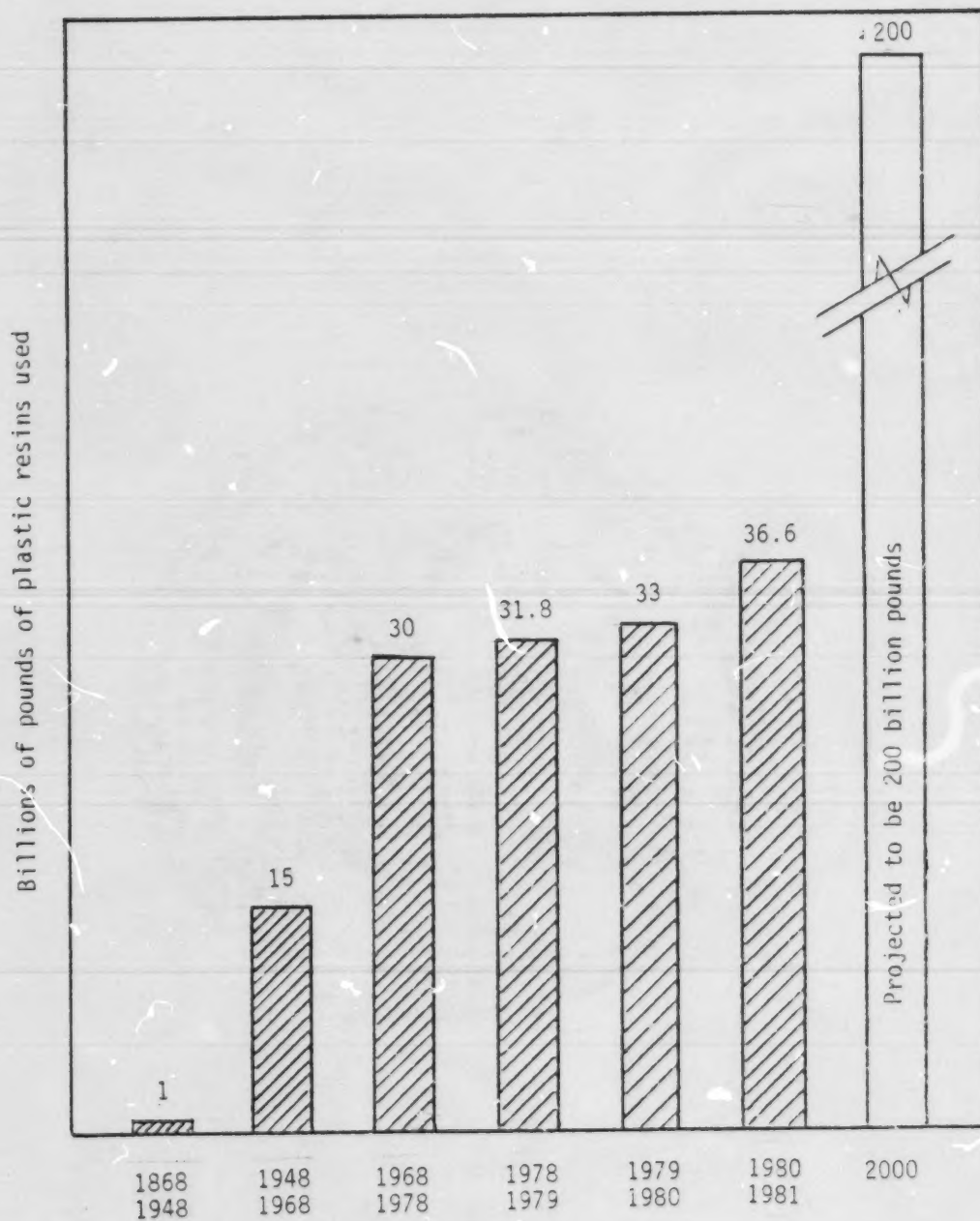


Figure I-I Domestic Plastic Production

During the mid to late 1940's, the production of plastic material exceeded that of aluminum production and the mid 1930's plastic production exceed copper production. The Society for Plastic Industry has predicted that the world consumption of plastic materials, measured in raw material by volume, will overtake steel by 1983, and will overtake steel in raw material by weight in the year 2000.

Today, plastics are accepted as basic materials used by designers and engineers. They take their place in industry along with metal, glass, wood and paper. They are truly a material of the future.

Statement of the Problem. Because of the wide range of job opportunities that exist in the plastic industry, and because of the specialized and technical nature of these occupations, it becomes increasingly more essential that knowledges and training programs be defined to meet the occupational awareness of this unique industry. However, there is a general absence of well defined guidelines within the state of Missouri, upon which information about the nature, need and training necessary for entry level technicians for the plastics industry. Absence of definite information leads to uncertainty among educators who are faced with the task of program and curriculum development.

Attention should be focused on occupational and educational stages of vocational/technical education programs for

the plastics industry. A high degree of cooperation and coordination needs to be maintained between representatives of the plastic industry and educators during the process of program development to establish the needs priority. For occupational criteria to be of maximum value in the educational setting, they should be based on the required skills and knowledges of the plastic industry.

Purpose of the Study. The purposes of this study were: (1) to identify tasks commonly performed by technicians employed in the plastics industry that require either long periods of personal experience or special training of the personnel who perform them; (2) to ascertain certain knowledges and skills for entry into the plastic related occupations, and (3) to ascertain whether or not there is a definitive body of knowledge and skill common to those several positions at the technician level. More specifically, the study attempted to answer the following questions:

1. What are the technician level positions now available in the field of plastics technology?
 - A. What are the job classifications and skill level titles?
 - B. How do these job titles fit in the occupational structure?
2. What specific duties are being performed by technicians in the plastic industry that require special knowledge and training as revealed by manufacturing, sales and fabrication of plastics products across the state of Missouri?

- A. What are the competencies needed by beginning individuals in the field of plastics technology in order to carry out their responsibilities as expressed by those surveyed?
- B. In the opinion of the manufacturing, sales, and fabricators of the plastic industry, what part of the training technician level positions is judged most desirable for formally organized pre-employment training?
 - a. What part may best be learned through on-the-job experience and what is the level of education attainment preferred for technician level workers?
- C. What is the present background requirements of personnel employed by plastics industries across the state of Missouri? What percentage of the present personnel employed in the plastics industry is male and/or female?
- D. What are the future plans for expansion of employment within the plastics industry across the state of Missouri?

Objectives of the Study. Since it is all evident that plastics is becoming deeply involved in all types of manufacturing, job requirements and personnel requirements are changing, a knowledge of plastics is essential since it is quickly replacing the old standard materials and processing methods. It is affecting major changes in the manufacturing processes used in industry.

Overall objectives for the study were:

- 1. to identify the plastic manufacturing technologies for the various forming and fabrication techniques found in Missouri's plastic industry.
- 2. to identify the job classification and skill levels necessary to enter the plastic industry of Missouri.

3. to identify the level and extent of education needed by entrants into Missouri's plastic industry.
4. to develop an insight into the current employment practices by Missouri's plastic industry.
5. to develop an insight into the future expansion plans by Missouri's plastic industry.

Definition of Terms. For the remainder of this report and study on Missouri's plastic industry, many terms will appear that may not be completely familiar to all readers. With this section, a brief definition of the plastic related terms will be given to conform to the plastic industry's technology.

Blow molding is generally used only with thermoplastics. This forming process is applicable to the production of hollow plastics products such as bottles, gas tanks and carboys. It has become an important process in the 1980's as a means of producing bleach and detergent bottles.

Calendering can be used to process thermoplastic materials into film and sheet rocks, and to apply plastic coating to textiles or other supporting materials. In calendering, film and sheet is passed between a series of three or four large, heated, revolving rollers which "squeeze" the material between them into a sheet or film.

Casting emerged in plastic forming a little over a half century ago, but formulation of materials suitable for casting and its widespread use are much more recent. Casting

may be used for both thermoplastic and thermosets to produce products by pouring a liquid monomer-polymer solution into an open or closed mold where it finishes polymerizing into a solid.

Compression/transfer molding is a combination of two similar but different processes packaged into one process. Compression molding is the most common method of forming products with thermoset materials. For the early history of the plastics industry, it was the single most important process. Compression molding is simply the application of pressure and heat to a thermoset material within the confines of closed mold.

Transfer molding was developed to facilitate the molding of intricate products with small deep designs or numerous metal inserts. A thermoset material is heated in a second cavity of the mold and is "transferred" through runners into the product cavity of the mold.

Encapsulating is a process of encasing a product in a plastic material, usually a thermoset, for protection against many different hazards. It is used most frequently in solid state electronics and novelties.

Engineer is a trained individual responsible for the designing, operating and managing the various phases of plant production. Usually the engineer will be required to have a minimum of a baccalaureate degree.

Extrusion is the method employed to form thermoplastic

materials into continuous sheeting, film, pipe, tube, rods, and specific profile shapes. It is one of the most frequently used forming processes used today.

Fabrication in industrial technology is the process of converting secondary stock products, film, sheet, rod, special shapes, into primary products. Fabricating is divided into three broad categories: (1) machining, (2) cutting, sewing and welding, and (3) forming (the latter includes a secondary process commonly known as thermoforming).

Fiberglass lay-up is a single process of a much broader family of processes technically referred to as reinforced plastic processing. Reinforced plastics are composites in which resins are combined with reinforcing materials, fiberglass, graphite fibers, etc. to produce products of exceptional strength-to-weight ratio. Fiberglass lay-up is a commonly followed process for products such as shower stalls, bathtubs, boats, automobiles, etc.

Foam molding is a manufacturing process which cuts across most of the processing techniques. Many different plastic resins can be "foamed" by chemically inducing a "blowing agent" which decompose under heat to generate the gases needed to create the cellular structure and for various controls to accomodate the foaming action. One of the most common expandable plastics is polystyrene, to produce the disposable cup, picnic dishes, insulation board, etc.

Injection molding developed into a major plastic process during the 1960's. The basic concept of thermoplastic injection molding revolved around the ability of a thermoplastic material to be softened by heat and harden again when cooled. The heated, and more fluid, plastic material is injected, under pressure, into a mold cavity where it cools and hardens again.

Laminating, thermosetting plastics are most frequently used for laminating which is distinguished by the use of high heat and pressure. Technically it is called high-pressure laminating. The end product of pressure laminating may be flat sheet, (such as counter tops) rods, tubes or formed shaped. The process consists of stacking layers of plastic film alternate with a reinforcing material and compressing with heat and time until the thermoset bonds the mass together.

Machine Operator is a person who operates a particular plastic production machine. The title may be further defined according to the specific production machine, e.g., "Blow molding machine operator". It is the operator's responsibility to assist setups, make adjustments, preheat dies, place pre-formed pellets or measured material in die cavities, control temperature and pressure, visually inspect the product for proper fill, surface blemish or discoloration etc. and to report any machine malfunction to supervision or set-up person.

Mold Maker is a person who is specially qualified, usually with a background as a millright or machinist, who is responsible for transforming product design into the mold for a specific plastic forming machine.

Molecular chemistry is the science of molecular structures. The plastic industry is completely dependent upon these theories for the development of resins.

Plastic defined simply means pliable or easy formed. Today, it has come to mean a general term to refer to all synthetically formulated materials. To understand plastic, one must first appreciate and accept the polymer chemist's ability to literally rearrange the molecular structure of the plastic or polymer to provide an almost infinite variety of compositions that differ in form, appearance, properties and characteristics.

Plastics Technology is the arts, crafts, skills, knowledge and scientific principle necessary to communicate the science and engineering concepts of the plastic industry to the production personnel. This includes in many respects the total management of plastic production.

Pre-training is a systematic method of gaining specific training prior to entry into a particular career family. Pre-training is usually organized by the public school system of a local district, or unauthorized by a statewide curriculum. Some pre-training activities may be supervised by the apprenticeship programs.

Rotational Molding, a technique like blow molding, is used to make hollow one-piece parts. Essentially, rotational molding consists of changing a measured amount of plastic resin into a warm mold which is rotated in an oven on two axes (sometimes more). In the oven, the heat penetrates the mold, causing the plastic material, usually in powder form, to melt and fuse together coating the inside surface of the mold. When cooled and opened, the mold will yield a plastic part with a hollow center.

Set-up Person is a person, generally with a higher classification than machine operator, with specific responsibilities to assist the mold and machine set-up prior to operation and may make pilot runs, and make critical adjustments.

Technician is an occupational classification that appears between the engineer and skilled, semi-skilled occupations. Any number of descriptive titles may be added to assist in greater classification of the job title, e.g., mold technician or resin technician.

Thermoplastic resins consist of long molecules, either linear or branches, having side chains or groups that are not attached to other polymer molecules. Thus, they can be repeatedly softened and hardened by heating and cooling. Usually, thermoplastic resins are purchased as pellets or granules.

Thermoset resins are reactive portions of the molecules

which form cross-links between the long molecules during polymerization. The linear polymer chains are thus bonded together to form a three-dimensional network. Therefore, once polymerized or hardened, the material cannot be softened by heating without degrading some linkages.

Scope and Limitations. The study was limited to the plastic firms with operating facilities in Missouri, involved in manufacturing, sales and fabrication of plastic components. The findings of this study were limited to the extent that the survey instrument was valid and accurate, the extent of the respondent's understanding of the procedure, and the extent to which they responded to the best of their ability.

The findings of this study are further limited by the extent to which the Project Director and panel of experts were able to interpret the plastic industry and relate to the survey procedures.

Sources of Data and Methods of Study. Plastic firms and individuals were surveyed as judged to be representative of the Missouri's plastic industry, from such points of activity as research, sales, fabrication and manufacturing industries. As much as these industries are distributed geographically, an attempt was made to include all locations within the state of Missouri.

Secondly, a given number of cooperating industries and associations were interviewed by telephone as an effective

means of obtaining additional supportive evidence for the investigation.

Implementation. The paper and pencil survey was conducted to accomplish the objective of this study. (See Appendix A)

The principal investigator had full responsibility for organization of the study, for preparation of instruments, identification of participants, recording and assimilation of the data and making all reports. The principal investigator had the assistance of a graduate student employed by the sponsoring institution, which gave considerable aid in conducting the study.

The following steps of procedure were followed:

- 1.0 During the planning the principal investigator was given to review any previous surveys, studies or works to avoid duplication of effort.
- 1.1 An extensive review of related literature was conducted.
- 2.0 A panel of four experts comprised of plastic industry personnel representing manufacturing, sales and fabrication and personnel management was established. (Appendix B) Responsibility of the panel was to review the instrument for (1) readability, (2) purpose, (3) technical accuracy, (4) ease of interpretation, (5) any prejudices and bias the principal investigator may have inadvertently built into the instrument, and (6) assist in the identification of the population to be surveyed.
- 3.0 Identification of population as nearly as it was the investigator's ability to obtain a complete list of manufacturers, sales and fabrication firms of plastic products within the physical boundaries of Missouri. (List appears in Appendix C) were surveyed. Principal methods of obtaining this listing were from:

- 3.1 Missouri Directory of Manufacturing and Mining published by Information Data Co. 3546 Watson Road, St. Louis, Missouri 63139
- 3.2 Information provided by the Society of the Plastic Industry Inc., 355 Lexington Avenue, New York, N.Y. 10017
- 3.3 The Society of Plastic Engineers, 14 Fairfield Drive, Brookfield, CONN 06905
- 3.4 The list was purged and screened for correctness and accuracy by the panel of experts and by a preliminary mailing of a post card. (Appendix D)
- 4.0 Preparation of survey instrument and cover letter was drafted by the principal investigator, tested by a panel of four experts.
- 4.1 Identification of survey components was assisted by the use of:
- 4.2 Job title classification, Dictionary of Occupational Titles, U.S. Department of Labor.
- 4.3 Encyclopedia of Job Description in Manufacturing by E. E. Ross, Published by H-1551-Information Systems and Services Incorporated P.O. Box 1231 Milwaukee, Wisconsin 53201
- 4.4 The Plastics Education Foundation, 656 West Putnam Avenue, Greenwich, CONN 06830
- 4.5 The International National Association of Machinists and Aerospace Workers, 1300 Connecticut Avenue, N.W., Washington, D.C. 20036
- 4.6 The final survey instrument and cover letter (Appendix E) was submitted to the Research Coordinating Unit of the Department of Elementary and Secondary Education, Missouri Department of Education for final approval.
- 4.7 Printing of the instrument was completed by the Central Missouri State University, Graphics Production Center
- 5.0 First mailing of instrument to each identified participant.

- 5.1 Fifteen days after the first mailing, a second mailing was completed to all participants not responding to the first mailing.
- 5.2 A telephone interview was conducted to obtain information of those not responding to either the first or second mailing of the instrument form.
- 6.0 Assimilation of data, after tabulation of survey instruments by respondents and the information organized.
- 6.1 The panel of four experts were called together a second time to rank order the priority of information received. The identified knowledges were placed in order of most important to those of lesser important knowledges needed by the entry level employee of the plastics industry.
- 7.0 The final report was prepared by the principal investigator in accordance with terms specified in the funding agreement and submitted in the specified quantities to the Research Coordinating Unit (Chapters 3, 4, 5, 6, 7 of this document).

CHAPTER 2

REVIEW OF RELATED LITERATURE

In 1968, one century after John Wesley Hyatt made his discovery of "plastic", the Society of Plastic Engineers, jointly with the Society of the Plastic Industry conducted a nationwide survey of approximately 5000 plastic processing firms. The study was designed specifically to identify the educational needs for potential employees, the availability of trained personnel, the types of plastic processing and what actions should be taken by the plastics industry to rectify these problems, if in fact they did exist.

Type of Processing. In 1968, the plastic processing companies responding to the SPE/SPI study indicated most companies processed plastic by more than one process.⁷ Injection molding was reported by 48 percent to be their major processing method, extrusion 20 percent, compression/transfer molding 18 percent, reinforced plastic 16 percent, thermoforming 15 percent, and blow molding 8 percent.

Mr. Ralph Lee Pittman reported in 1971 in a study of Missouri's plastic industry that injection molding was the most frequently used process of Missouri plastic processes, followed by thermoforming, extrusion and compression/transfer

⁷ Graham, George; Waite, William; Ward, Nancy; The Need for Plastics Education, Plastics Education Foundation, Albany, New York, p. 8.

molding.⁸ Modern Plastics magazine reported in 1980 a startling change in the most frequently used process of the U.S. plastic processing.⁹ The extrusion process was performed by 36 percent, injection 32 percent, calendaring 5 percent, casting 5 percent, compression 3 percent, power 2 percent, and all other processes 16 percent. The combination of extrusion and injection represents 68 percent of all plastic processing methods.

The rapid acceptance of plastic pipe and tubing has contributed to the change of status of processes.

Job Classification. The job level found by the SPE/SPI study to be the most difficult to find employees for was the skilled positions. Skilled employees for the plastic industry of 1968 were considered most difficult to hire.¹⁰ Sixty percent of all 5000 returns indicated a shortage of skilled employees. This varied only slightly by geography and company size.

The set up person was identified to be a very special job title that there was a major difficulty in finding personnel for. Forty-four percent of the companies employing

⁸Pittman, Ralph Lee, Factors for Determining Industrial Plastics Education in Missouri's Vocational-Technical Schools and Junior Colleges, Master's thesis, Department of Occupational Education, Southern Illinois University, August 1972.

⁹_____, "Materials 1980: The Outlook for Materials, Supplies and Prices." Modern Plastics, January 1980.

¹⁰Graham, OP.Cit., p. 9.

20-60 employees reported major difficulty in locating personnel for the set-up classification titles.¹¹

Hiring Preference. The 1968 study asked the following question: "Which would you prefer to hire, new pre-trained employees or non-trained?" Seventy-seven percent of all replies indicated a preference for high school graduates with plastics training as compared with 17 percent for high school graduates with no plastic training, and 6 percent for non-high school graduates willing to learn.¹²

One conclusion of the study indicates that, "If the education and training for the technical level should include set-up training for machines, it would provide a dual purpose."¹³ The training would bridge both the technician and set-up man needs of the industry. If this was accomplished by education, the results would fulfill both areas and become the job level most desired by industry.

Mobility of Plastic Industry. The plastics industries are not confined to Chicago, Detroit or any of the so-called industrial centers of the U.S., but are scattered over most of the 50 states, Canada and Mexico. With the challenge of these industries, the individual with some degree of pre-

¹¹Graham, OP.Cit., p. 11.

¹²Graham, OP.Cit., p. 12.

¹³Graham, OP.Cit., p. 23.

training should be able to find a wide range of employment opportunities within a reasonable distance of the location of the applicant's home, whether across town or across the country.¹⁴

The 1980 Civilian Labor Force. Historically, men have always been the dominate sex in this country's work force. Men have traditionally been employed in the professions, managerial, engineering/technical and science occupations. Men have also been predominate in the unskilled, semi-skilled and skilled occupations. During the last half of the seventh decade of the twentieth century, women started taking more than fifty percent (50%) of the new jobs, according to the National Commission on Employment Policy.

The United States Census Bureau and Bureau of Labor Statistics reported that the male labor force has declined ten percent (10%) since 1910 while women in gainful occupations have increased forty-eight percent (48%) since 1910. An analysis of the occupational categories show that during the decade between 1970 and 1980 changes in labor force have occurred: (1) The officials and managers, male hours declined by eleven percent (11%) while females employed in this category have increased a modest five percent (5%)

¹⁴ , Professional Careers in the Polymer/Plastics Industries, Society of Plastics Engineers, Inc., Brookfield Center, CT

according to the National Commission on Employment Policy.

(2) Males professionally have declined twelve percent (12%) and women employed as professionals have increased eight percent (8%). (3) Technicians of the United States work force have experienced a decline by twenty percent and females have increased ten percent (10%). (4) The craft worker category has been the most stable of the four groups, male decline experienced only five percent (5%) during the same period female increases totaled only two percent (2%).

The conclusions offered by the Commission are that the various employment measures will achieve progress for, female employment, only in combination with improvement in the pipeline of education and training, and economic climate that creates new opportunities and the personal commitment of top managers who still retain considerable contact with their work forces.

CHAPTER 3

NATURE OF PLASTIC INDUSTRY IN MISSOURI

The following chapters are a summation of the respondents to the survey instrument (Appendix A) mailed to three hundred and fifty-five (355) industries identified to be representatives, if not the total, of the plastics industry in Missouri. One hundred and twenty-nine (129) or thirty-six percent (36%) of the questionnaires were returned and appropriately completed. It is the expertise of these respondents upon which these data were compiled and reported here.

"The activity which is the subject of this report was supported in whole or in part by funds from the Department of Elementary and Secondary Education, Division of Career and Adult Education. However, the opinions expressed herein do not necessarily reflect the position or policies of the Missouri Department of Career and Adult Education, and no official endorsement should be inferred."

Geographic Location and Distribution of the Plastics Industry Within the State. It is evident by the number of responses and frequency of returns that the two metropolitan areas are the center of plastic production for the Missouri Plastic Industry, as indicated in Table I. The southern portion of the state contributed a greater number of responses to the survey, therefore, indicating that the plastic industry within the State is more prominent in the areas south of the Missouri River. With seventeen responding

industries coming from the southeast area giving the shift of balance to that portion of the state.

Employment Status of Missouri's Plastic Industry. One of the factors of uniqueness about the plastic industry is the high degree of automation exhibited by the manufacture of plastic products. Some industries are able to produce high volume products with low levels of manpower input. According to data derived from the Missouri Directory of Manufacturing and Manufacturing, a total of 66,847 individuals are employed in some phase of the plastic industry, manufacture, design, sales or research.

A total of 111 plastic industries responded to the questionnaire item relating to the numbers of employees directly related to plastic production. Fifty-five (55) or 44 percent indicated that they employ twenty-five (25) or fewer individuals. However, thirty (30) or 29 percent of the respondents indicated they employ 101 or more employees who are directly involved in production of plastic products (figure 3-1). Fourteen (14) or 11.2 percent employ 26 to 50 individuals, twelve (12) respondents or 9.6 percent employ 51 to 75 and fourteen (14) respondents indicated their labor force was between 76 and 100 individuals.

Percentage of the Total Work Force Related to Plastic Production. The plastic industry is elusive in nature. Much of the plastic industry is a part or phase of a larger

TABLE I

GEOGRAPHIC LOCATION OF MISSOURI PLASTIC INDUSTRY

Locations by City and Area of Survey Responses		
Saint Louis Metropolitan Area		41
Kansas City Metropolitan Area		25
Southeast Area		17
Cape Girardeau	(2)	
Hermann	(2)	
Jackson	(2)	
Owensville	(1)	
Ironton	(1)	
Union	(1)	
Perryville	(1)	
Sikeston	(1)	
Ellisville	(1)	
Doniphan	(1)	
Fenton	(1)	
Valley Park	(1)	
Bismarck	(1)	
Williamsville	(1)	
Central Area		14
Independence	(6)	
Jefferson City	(2)	
Grandview	(1)	
Higginsville	(1)	
Lee Summit	(1)	
Blue Springs	(1)	
Harrisonville	(1)	
Pilot Grove	(1)	
Southwest Area		13
Springfield	(4)	
Joplin	(3)	
Nixa	(1)	
Cassville	(1)	
Ozark	(1)	
Mountain View	(1)	
Gainesville	(1)	
Conway	(1)	

TABLE I (Cont')

Northeast Area		11
Brookfield	(3)	
Mexico	(2)	
Kirksville	(1)	
Columbia	(1)	
Hannibal	(1)	
St. Peters	(1)	
Louisiana	(1)	
Jonesburg	(1)	
Northwest Area		8
St. Joseph	(3)	
Excelsior Springs	(2)	
Richmond	(1)	
Sullivan	(1)	
Lawson	(1)	
Total		129

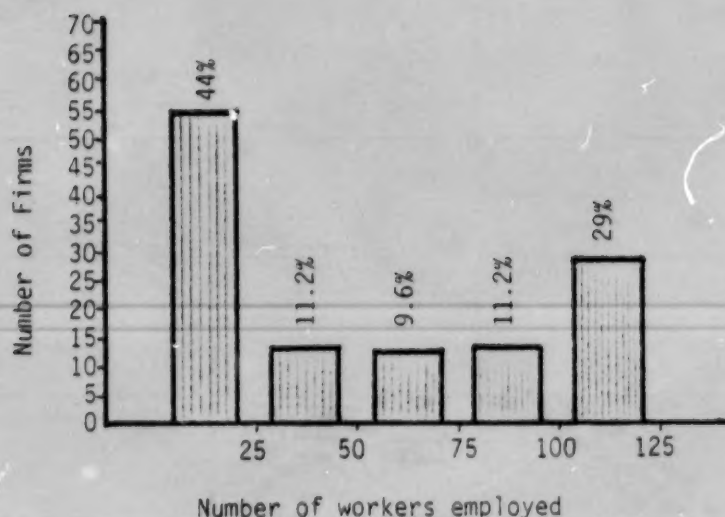


figure 3-1 NUMBER OF EMPLOYEES IN MISSOURI PLASTIC INDUSTRY

manufacturing enterprise. An example, a garment factory may also be a part of the plastic industry by nature of the plastic garment hanger which they produce in plant or the dairy industry may be included in the plastic industry by nature of their subsidiary in-plant production of dairy containers. As a result those industries included in the survey were asked to identify the percentage of their employees directly related to plastic production. Of the 123 firms responding to this item, sixty-three (63) or 51.2 percent of the respondents indicated that 76 to 100 percent of their work force was contributed to plastic production (figure 3-2). Also thirty-three (33) or 26.8 percent responding indicated that only 1 to 25 percent of their work

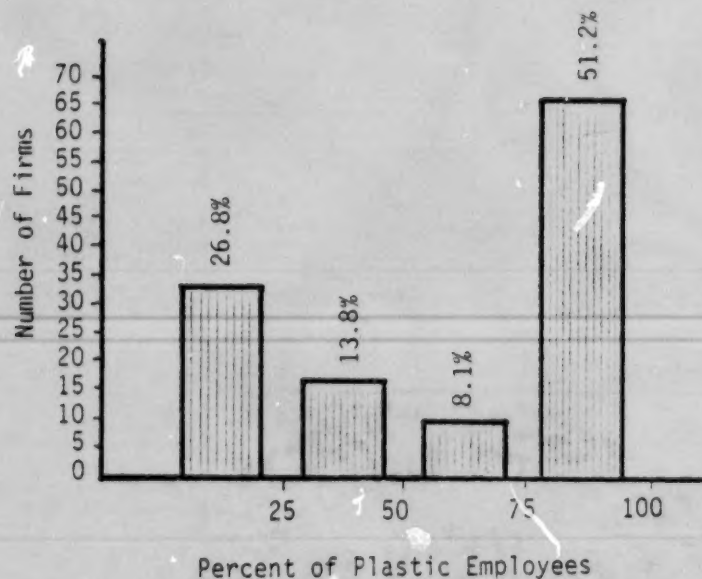


figure 3-2 PERCENT OF FIRM'S WORK FORCE RELATED TO PLASTIC PRODUCTION

force contributed directly to production to plastic products, indicating that nearly three-quarters of their industrial products was something other than plastic materials. At the same time, seventeen (17) or 13.8 percent of the respondents reported from 26 to 50 percent of their employees were involved in plastic manufacture and ten (10) or 8.1 percent were utilizing 51 to 75 percent for plastic production. These data are evidence of the fact that much of the plastic industry is conducted not as a distinct separate industry, but in conjunction with some other form of manufacture. However, not exclusive.

Percent of Female Workers in the Plastic's Work Force.

As indicated in Chapter 2, women in the National Labor Force

was on the increase, especially in the managerial, professional and technical areas. The survey made an attempt to gain some insight concerning the impact female employees were making on the plastic industry labor force. Of the 125 responding to the survey item, fifty-one (51) or 48 percent indicated that from 1 to 25 percent of their work force were female, (figure 3-3), thirty (30) or 24 percent indicated

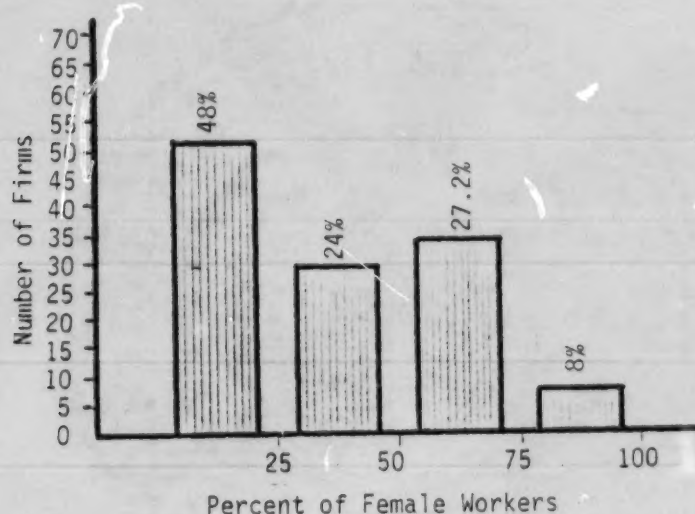


figure 3-3 FEMALES IN PLASTIC'S WORK FORCE

that 25 to 30 percent of their work force was comprised of women, thirty-four (34) or 27.2 percent responded that 51 to 75 percent were women. However, only ten (10) or 8 percent responded that their labor force was from 76 to 100 percent female. The telephone phase of the study revealed that many employees prefer female employees. Reasons cited were: (1) agility, (2) dexterity and (3) sense of detail.

The Plastic Industry Planned Expansion. The true state of the vitality of any industry is its expectations about the future. If the industry is optimistic enough to be willing to invest in the future through growth and expansion, then new and vital jobs will be created. The plastic industry of Missouri responded to the questionnaire very positively in their intentions about future expansion. Sixty (60) or 50.8 percent of the respondents indicated they have plans to expand their production facility in the very near future (figure 3-4). Only eight (8) or 6.8 percent

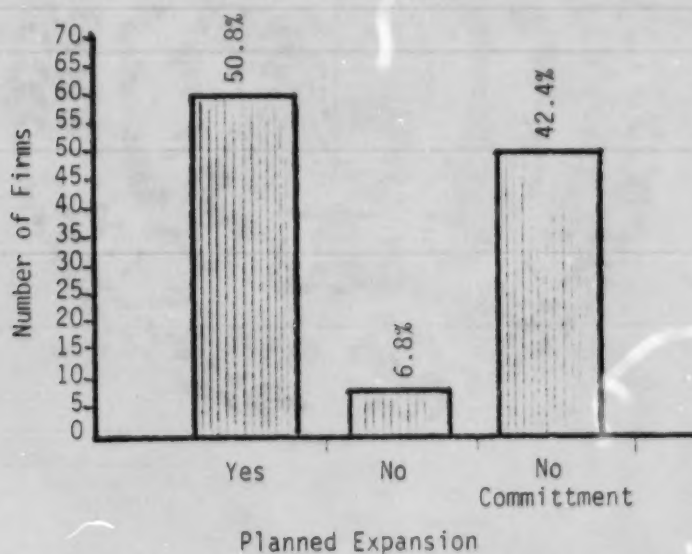


figure 3-4 MISSOURI'S PLASTIC FIRMS PLANNING TO EXPAND THEIR PRODUCTION FACILITY

indicated they have no expansion plans, fifty (50) or 42.4% indicated no commitment. The advisory committee suggest they are thinking of expansion, but have not made the final

decision.

Another sign of the strength of Missouri's plastic industry may be decided by the amount of raw plastic material formed into consumer products each year. In Table II is reported the average pounds of plastic formed annually by these production plants. The smallest reported amount was

TABLE II

Approximate Pounds of Plastic Materials
Formed in Past Year (1981)

Low	300 lbs.
High	30,000,000 lbs.
Total	283,472,500 lbs.
Average	3,081,223 lbs.

only 300 pounds of material per year. The largest reported consumption was 30 million pounds. The total amount of plastic used by the 129 reporting firms was 283,472,500 pounds of the various types of plastic compounds. This was an average of 3,081,223 per firm per year. It was stressed by the advisory panel that the low of only 300 pounds of annual production, in all probability, is an error in reporting and should not be considered typical of the plastic industry in Missouri.

Summary

Three hundred and fifty-five plastics firms were identified to be representative of the industry. Responses were collected from 129 firms of this group or the survey concluded its findings on 36 percent of the original questionnaires mailed. It is not evident that the St. Louis metro area with 41 individual returns and Kansas City metro area with 25 returns are the central location of the plastic industry. The Southeast area also may be considered as central with that area's contribution to the State's plastic industry. The area generally described as being north of the Missouri River reported fewer firms actively involved in plastic production than the areas south of the Missouri River.

Generally, the average plastic firm is not a labor intense industry. Of the 129 reporting plastics firms, 44 percent of the responding firms indicated they employed fewer than twenty-five (25) employees. However, 29 percent employ more than 100 persons for plastic production.

Those firms responding to the survey reported that women contribute heavily to the work force of the plastic industry in Missouri.

From the reporting firms' responses, the advisory panel concluded that the plastics industry has a very positive outlook for the future. Over 50 percent of the firms

reported they have plans for expansion of their plastic production facility. The average plastic plant forms 3,081,223 pounds per year.

It is the conclusion of the advisory panel that the plastic industry in Missouri is vital to the state's economy and contributes significantly to the employment of Missouri's work force.

CHAPTER 4

MANPOWER OF THE PLASTICS INDUSTRY IN MISSOURI

The growth of the plastics industry of Missouri contributes to create a demand for personnel. The diversity of the plastics field allows individuals to exercise their talents through a wide variety of jobs. Trained people participate in all phases of the plastic industry from raw material's suppliers to plastic machinery manufacturers, from plastics compounders and convertors to suppliers and product users. While the majority of jobs are in product and process areas, the industry also needs individuals in research, technical services, marketing, consulting or teaching. Plastic producers are particularly interested in the production of consumer products, typical of job classifications are: supervisor/foreman, machine operator, set-up person, mold maker, technician and engineer.

Job Classification for Hiring Production Personnel. As indicated in figure 4-1, ninety-three (93) or 78.7 percent of the firms responding to this section indicated their firm used the job classification of supervisor/foreman. Ninety-three (93) or 76.9 percent responded they use machine operator to designate this employee's responsibilities. Twenty-eight (28) or 36.8 percent responded positively to the use of set-up person while forty-eight (48) or 63.2 percent responded negatively to the use of set-up person as a title

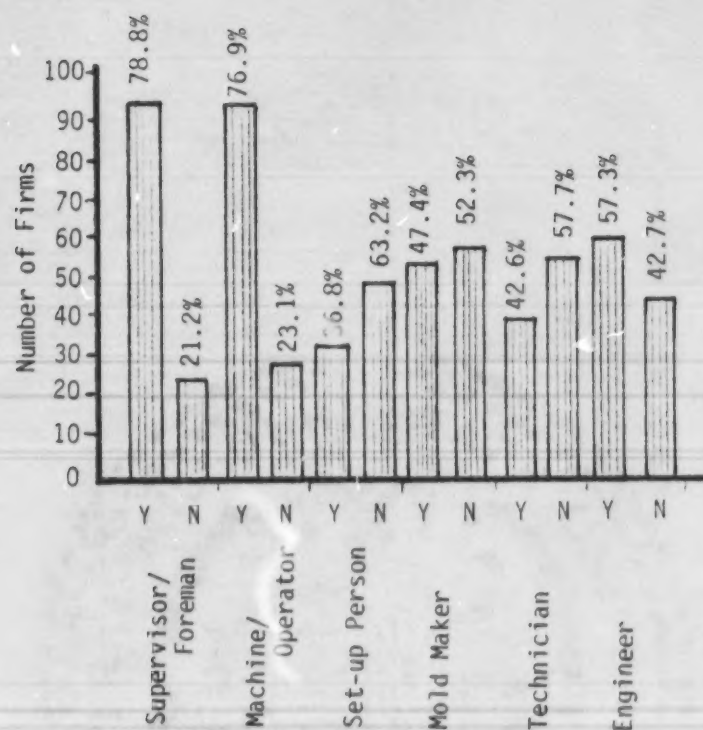


figure 4-1 JOB CLASSIFICATION IN THE PLASTIC INDUSTRY

of definition. The advisory panel, with their experience and knowledge of the plastic industry suggested that the title of machine operator and set-up person are in reality one or the same title. The automatic nature of the plastic processing machines is now resulting in the combining of the two separate titles.

Mold making is a job classification that fifty-two (52) or 47.7 percent of the respondents reacted positively toward. However, fifty-seven (57) or 52.3 percent indicated that they

did not use the title. Again the advisory panel has indicated that the majority of the plastic forming industry does not employ mold makers or have any mold making facility. Generally, the mold making responsibility is "farmed out" to a specialty shop. However, the plastic processor will employ mold maintenance individuals for the purpose of minor repairs.

Forty (40) firms or 42.6 percent of those responding to the questionnaire indicated their use of the title technician, while fifty-four (54) or 57.7 percent do not use the title. The title of engineer is used by fifty-nine (59) or 57.3 percent but forty-four (44) or 42.7 percent do not use the title.

Choice of Employee by Sex for a Given Job Classification. It was reported in Chapter 2 and 3 that the female employees are increasing their contribution to the work force and have gained significant numbers in the plastic industry. Of the plastics firms responding, nineteen (19) or 18.3 percent indicated a preference for male machine operators, thirty-one (31) or 29.9 percent indicated a preference for female machine operators, and fifty-four (54) or 51.9 percent have shown no difference in their preferences for machine operators, figure 402. For the set-up person, fifty-two (52) or 57.1 percent gave a preference for the male, while only one (1) or 1.1 percent preferred the female and thirty-eight (38) or 41.8 percent have no special

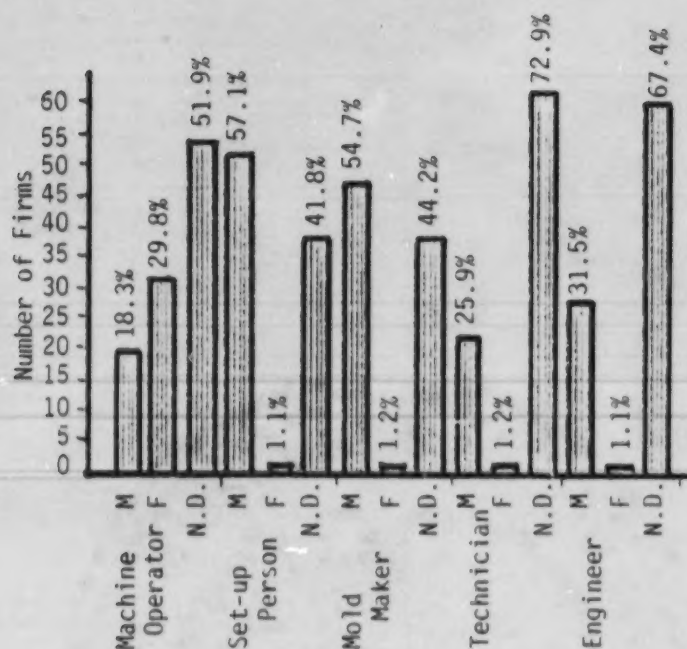


figure 4-2 CHOICE OF EMPLOYEE BY SEX FOR A GIVEN JOB

preference.

The mold maker received forty-seven (47) or 54.7 percent responses in favor of the male and thirty-eight (38) or 44.2 percent with no difference. The female preference was only one (1) or 1.2 percent for the classification of mold maker.

Twenty-two (22) or 25.9 percent of the responses preferred males for the job title of technician, one (1) or 1.2 percent preferred the female and sixty-two (62) or 72.9 percent indicated no preference for the job title of technician. The job title of engineer was supported by twenty-eight (28) or 31.5 percent of the responses in favor of males for the title engineer. One (1) or 1.1 percent

preferred the female for the job classification of engineer and an overwhelming sixty (60) or 67.4 percent have no preference of sex in the job title of engineer.

The advisory panel responded to these data by commenting: the job titles have been traditionally male dominated, that women have not discovered the opportunity as of this date. They also noted that by the large no difference preference, the opportunities for female employ are very real.

Technician Defined by Plastic Industry. The term technician has been used in many ways by many industries. This study attempted to gain a collective definition of what the duties and responsibilities of a technician is within the plastic industry of Missouri. Table III is a composite of the titles and duties as reported by the respondents to the survey. The most frequently used definition which was received from the respondents of the survey, personal interviews and telephone conversations with management personnel of Missouri's Plastic Industry are: (1) "Troubleshooting" in nature - a person who can define, analyze, and correct a malfunctioning machine or process and (2) Quality Control.

Difficulty in Hiring Personnel by Job Classification. As indicated in figure 4-3, the respondents have cited those job classifications which they have the greater difficulty in hiring personnel. Thirteen (13) or 10.2 percent indicated

TABLE III

Definitions of Term "Technician" by the Plastic Industry

Title Used:

Extrusion Technician -	Engineering, conducts research and development
Process Operator -	(1) Training, troubleshooting (2) Run new dies, R-D work, write run sheets
Technical Service -	Installation, training personnel, service of machines, tool modifications, troubleshooting
Shift Supervisor -	Management duties
Plastic Technician -	Knowledge of plastics, chemical resistance impact strength, resilience, appearance, etc.
Quality Control Technician -	Industrial Engineering
Research Laboratory Technician -	Quality Control - works under chief chemists
Machine Operator -	Minor mold repair, maintenance, machine set-up
Manufacturing Technologist -	Troubleshooting cycle reproduction, machine maintenance, machine set-up
Electrical Technician -	(1) Electronic troubleshooting (2) Micro-processing, switches, solid state circuitry
Molding Technician -	(1) Improve molding techniques (2) Responsible for new projects and specifications (2) Assist engineer, collect and plot data, routine tests and studies.

the machine operator was the most difficult job to hire personnel for, thirteen (13) or 10.2 percent agree that the set-up person is the most difficult. If, as reported in figure 4-1, where the advisory panel concluded that the machine operator and set-up person are one and the same, then the combined total of twenty-six (26) or 20.4 percent of the respondents find this employment area difficult to fill, then there is a significant deficiency in this job area.

Twenty-five (25) or 19.5 percent, figure 4-3, of the

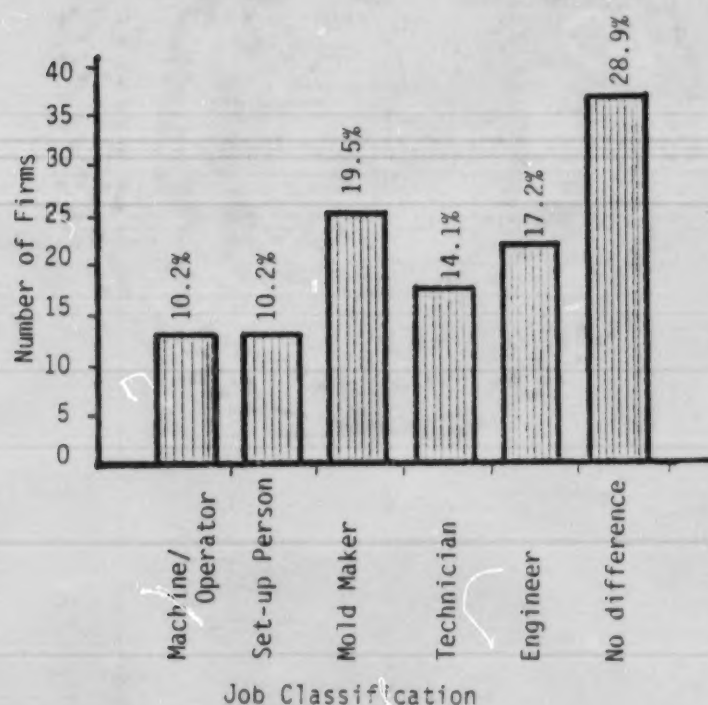


figure 4-3 MOST DIFFICULT POSITION TO FILL IN PLASTICS INDUSTRY

firms reporting have indicated the mold maker to be the most difficult area to hire for. The technician classification was reported by eighteen (18) or 14.1 percent to be their most difficult classification to find personnel. Twenty-two (22) or 17.2 percent concluded their employment difficulty was in the employment for the engineer classification. However, it is well to note that thirty-seven (37) or 28.9 percent have indicated no particular problem in any classification.

Prediction for Future Labor Supply for the Plastic Industry in Missouri. Twenty-four (24) or 21.4 percent of the respondents indicated Missouri's plastic industry would experience a shortage in their labor force during the next ten years, figure 4-4. Forty-two (42) or 37.5 percent agree that the labor supply would be about equal to the demand while forty-six (46) or 41.4 percent concluded that their needs would be filled by a general surplus in supply. The advisory panel attributed two major reasons for the possible indication by the survey suggestions of a surplus of labor: (1) The present economic condition, current unemployment factors and the general business and industry reaction, and (2) additional industrial automation, including the accelerated use of industrial robots.

Job Classification Necessary to Fulfill the Expansion Plans of the Plastic Industry. It is apparent that if the

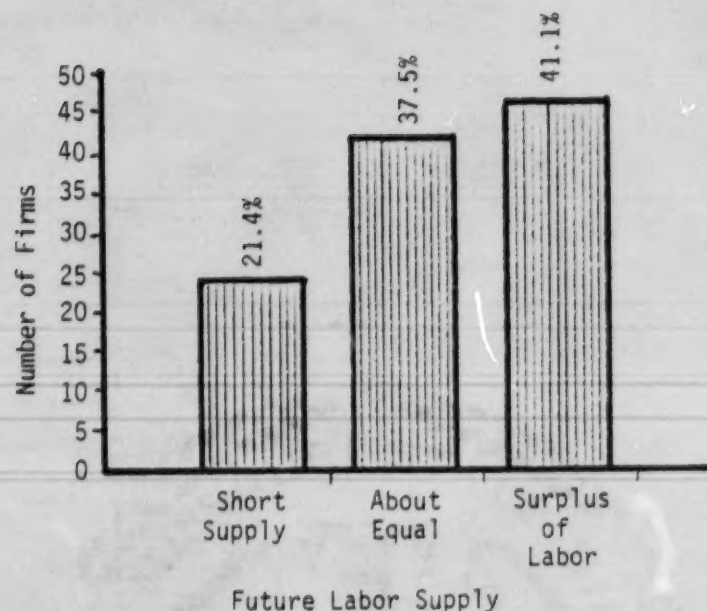


figure 4-4 PREDICTIONS OF FUTURE LABOR SUPPLY FOR THE MISSOURI PLASTIC INDUSTRY

industry is planning expansion, some personnel will be needed. Forty-seven (47) or 28.5 percent of the respondents have indicated the machine operator will be their most critical need for their expansion plans, figure 4-5. Twenty-five (25) or 15.2 percent of the responding firms predict they will find the most critical area of personnel in the set-up person. The mold maker was reported by twenty-two (22) or 13.3 percent to be their most needed personnel area for their expansion plans. Likewise the technician was reported by twenty-three (23) or 13.9 percent to be their most critical area for expansion employees. Nineteen (19)

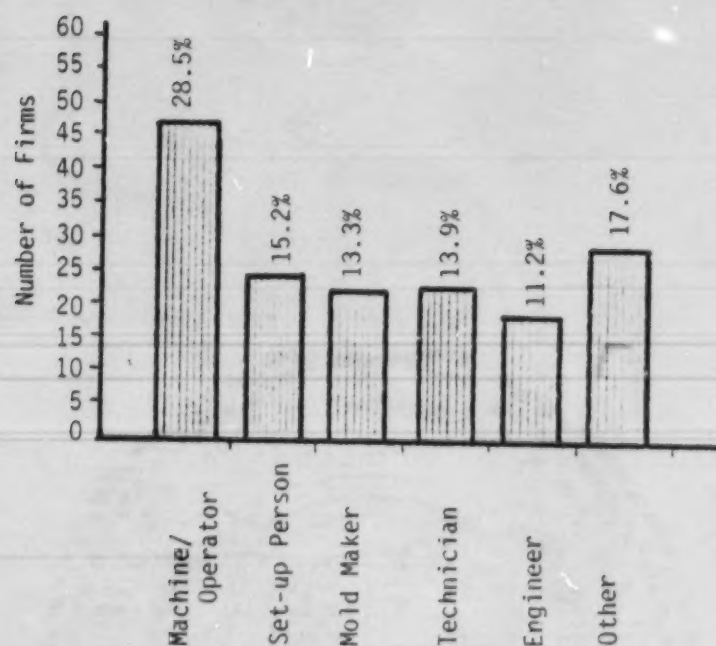


figure 4-5 JOB CLASSIFICATION NEEDED BY THE PLASTICS INDUSTRY FOR THEIR FUTURE EXPANSION

or 11.2 percent indicated their problem job classification area will be the engineer and twenty-nine (29) or 17.6 percent of the firms reporting cited the general category of "other" without definition.

The advisory panel of experts in their analysis of these data concluded that if the set-up person and technician classification were combined as reported by twenty-five (25) and twenty-three (23) respectively with a combined 29 percent, and each of these classifications requiring considerable pre-employment training, that here is a significant number of future employees with a need for job training.

Especially, if the industry's own definition of a "technician" is that of a "troubleshooter" or "Quality Control" expert, then pre-employment training is necessary. As reported in figure 3-2, over 50 percent of the reporting plastic firms are planning expansion in the near future.

Source of Current Employment Needs. The cooperating plastic industry firms were asked to identify their current source of employees. Of those firms responding, thirty-eight (38) or 18.2 percent indicated their new employees come from other plastic processors, figure 4-6, while forty-

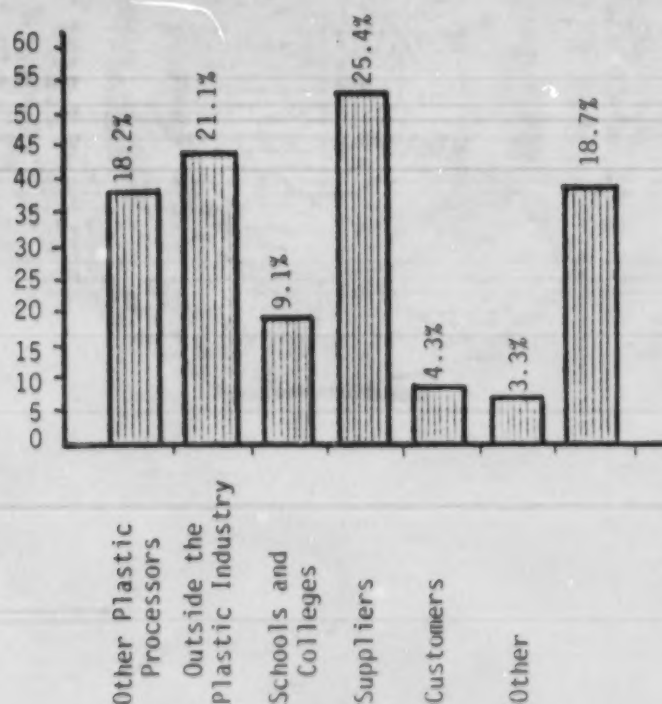


figure 4-6 SOURCES OF EMPLOYEES FOR MISSOURI'S PLASTIC INDUSTRY

four (44) or 21.2 percent indicated they were able to employ from outside the plastic industry. Nineteen (19) or 9.1 percent employed directly from training institutions. However, an overwhelming number of respondents indicated they hired from within the plant. Fifty-three (53) or 25.4 percent agreed that the practice of up-grading their employees was a significant source of qualified personnel.

Nine (9) or 4.3 percent responded that they employed from their suppliers, seven (7) or 3.3 percent from their customers and thirty-nine (39) or 18.7 percent responded to the category of other.

Method of Compensation for the Various Job Classifications. Are the various job classifications compensated for by salary or hourly wage. Figure 4-7, reveals that the predominate method of compensation for the machine operator, set-up person and mold maker are hourly waged jobs. The technician and engineer are salaried.

For those job classifications compensated by the hourly wage method, sixty-two (62) or 31.5 percent of the firm reporting indicated that their entry-level wage most frequently paid was between \$3.00 and \$5.00 per hour, figure 4-8a. Thirty-two (32) or 16 percent of the respondents salary structure allowed entry-level wages of between \$5.00 and \$7.00. Twelve (12) or 6.1 percent of the firms reporting offer wages of between \$7.00 and \$9.00. Five (5) or 2.5

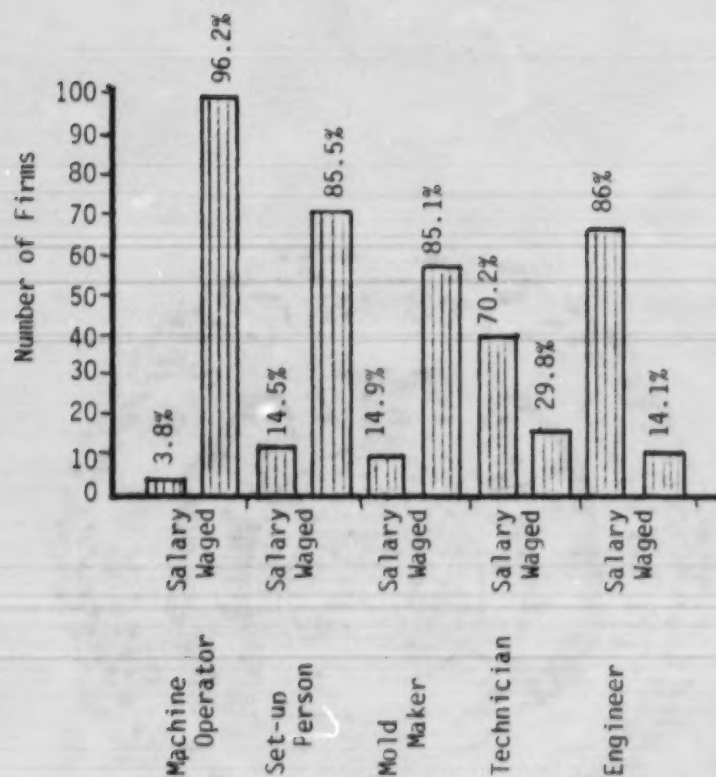


figure 4-7 METHOD OF COMPENSATION FOR THE VARIOUS JOBS OF THE PLASTIC INDUSTRY

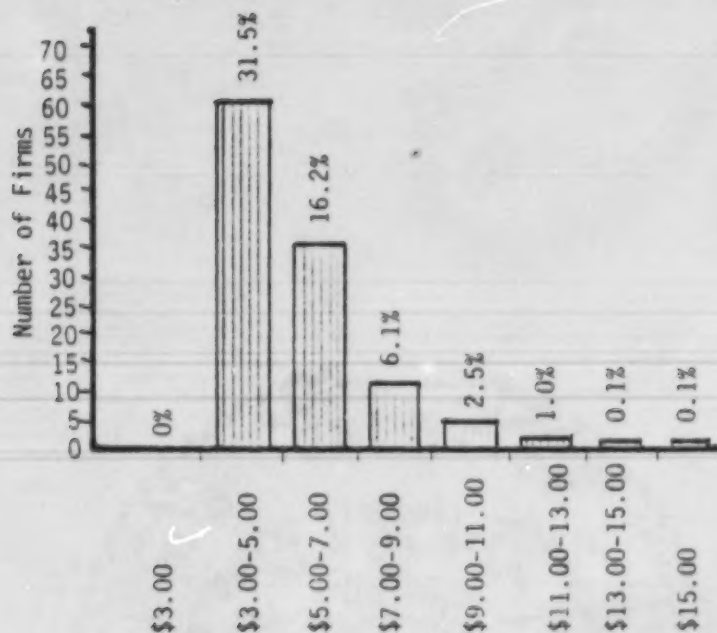


figure 4-8a ENTRY LEVEL SALARIES PAID HOURLY EMPLOYEES
BY THE PLASTICS INDUSTRY

percent have wage scales of \$9.00 to \$11.00, two (2) or 1.0 percent pay \$11.00 to \$13.00, one (1) or 0.1 percent will pay \$13.00 to \$15.00 and also one (1) or 0.1 percent reported their firm's wage scale for entry level wage of greater than \$15.00 per hour.

Salaries paid the technician and engineer or other salaried personnel are reported in figure 4-8b. Based on their firm 1981 hiring practices, one (1) or 0.1 percent of Missouri's plastic industry pay entry level salaries of \$8,000 or less. Four (4) or 2.0 percent of the firms reporting offer salaries of between \$8,000 and \$10,000,

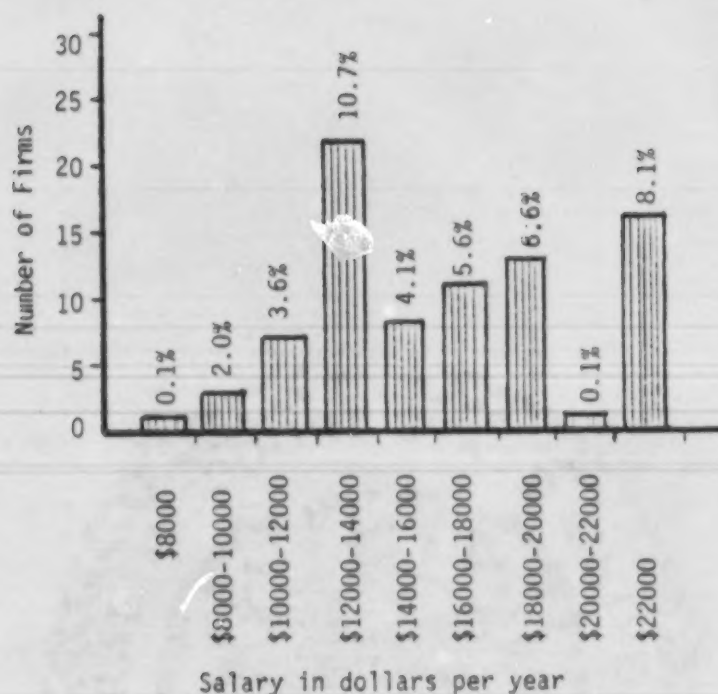


figure 4-8b ENTRY LEVEL SALARIES PAID SALARIED EMPLOYEE
BY THE PLASTIC INDUSTRY

seven (7) or 3.6 percent offer between \$10,000 and \$12,000, while twenty-one (21) or 10.7 percent offer salaries ranging between \$12,000 and \$14,000.

Eight (8) or 4.1 percent will pay \$14,000 to \$16,000, eleven (11) or 5.6 percent have established salary ranges of between \$16,000 and \$18,000 and thirteen (13) or 6.6 percent have entry level salaries of between \$18,000 and \$20,000, while one (1) or 0.1 percent will offer the entrant \$20,000 to \$22,000 and sixteen (16) or 8.1 percent of those firms responding to the survey item indicated they have

entry level salaries of \$22,000 or greater.

A note: from the advisory panel of experts, they concluded that \$12,000 to \$14,000 interval probably included the technician's job classification and the \$22,000 or greater interval include the engineer job classification.

Summary

In general, it can be summarized that the general job classification within the plastic industry follow the same as any other industrial production organization, supervisor/foreman, machine operator, set-up person, mold maker, technician and engineer. Women are contributing to the work force and there is probably a greater potential for female employment in the plastic industry than is currently realized by those who seek employment.

The plastic industry has expressed their greatest employment need may be classified and machine operators. At the same time, the employment practice the individual firms engage in most frequently is the up-grading of personnel from within their own personnel structure. For the plastic firms in Missouri who are planning to expand their facility and production practices, the machine operator was identified as their most critical job classification to fill.

The machine operator, set-up person and mold maker of the plastic industry are most predominantly compensated by the hourly wage with the wage most frequently paid at entry

level being between \$3.00 and \$5.00. The technician and engineer job classification are predominantly salaried positions with the two most frequent range intervals being between \$12,000 and \$15,000 per annum and \$22,000 or greater per annum for the entry salaries.

CHAPTER 5

TRAINING REQUIREMENTS OF THE PLASTIC INDUSTRY IN MISSOURI

Missouri has several different levels and types of educational opportunities to be taken advantage of by its youth for the benefit of the industrial enterprises of the state. The middle schools offer industrial exploratory classes. The secondary school offers a variety of programs: industrial arts, trade and industrial, and area vocational courses. Courses are offered for career orientation and for occupational entry. The junior colleges offer a variety of technical program designs for vocational-technical competencies and the University system offers programs for in-depth technical and scientific expertise. These systems are available to improve and promote the plastic industry of Missouri.

Plastic Industries Pre-training Preference for Its Work Force. Figure 5-1 reports the data generated by the survey item designed to establish the training type preferred by the firm responding to the survey. Six (6) or 3.6 percent indicated they would prefer non-high school graduates willing to learn. The data revealed that thirty-five (35) or 20.9 percent of the respondents have shown a preference that their prospective work force should be high school graduates with no special plastics training. Fifty-nine (59) 35.3 percent of those firms responding to the survey item indi-

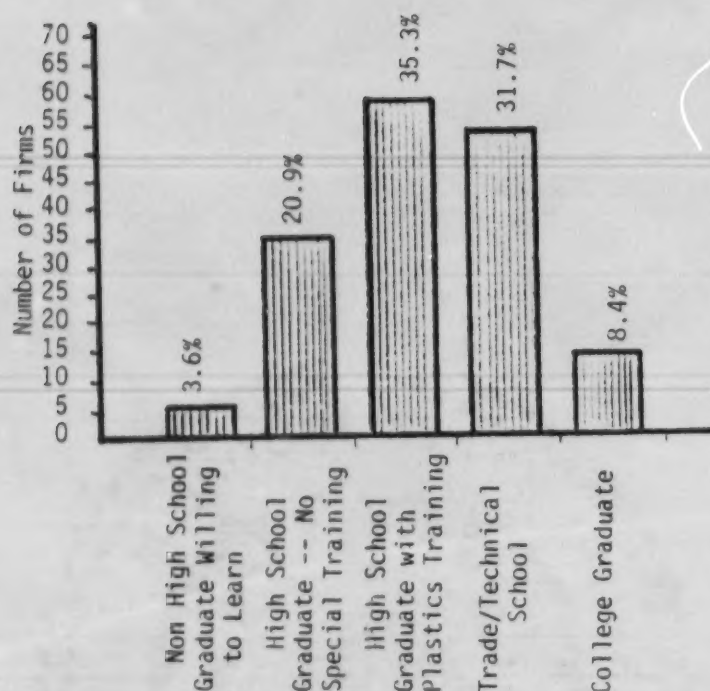


figure 5-1 TYPE OF PRE-EMPLOYMENT TRAINING DESIRED BY MISSOURI'S PLASTIC TRAINING

cated their preference was for the high school graduate with plastics training, were the most desirable as prospective employees. Also fifty-three (53) or 31.7 percent have shown a strong preference for prospective employees who have attended a trade/technical school. Fourteen (14) or 8.4 percent indicated their preference for their employee to originate their training at the college or university level.

Levels of Job Experience Desired. The training of any personnel in a particular expertise may be measured in terms of lost production time. It is the idea to bring individuals

into the work force who have had similar experience, thereby relieving the burden of in-plant employee preparation, thereby maintaining a high level of productivity. To accomplish this, many firms expect the prospective employee to have some basic experiences. Figure 5-2a reports the

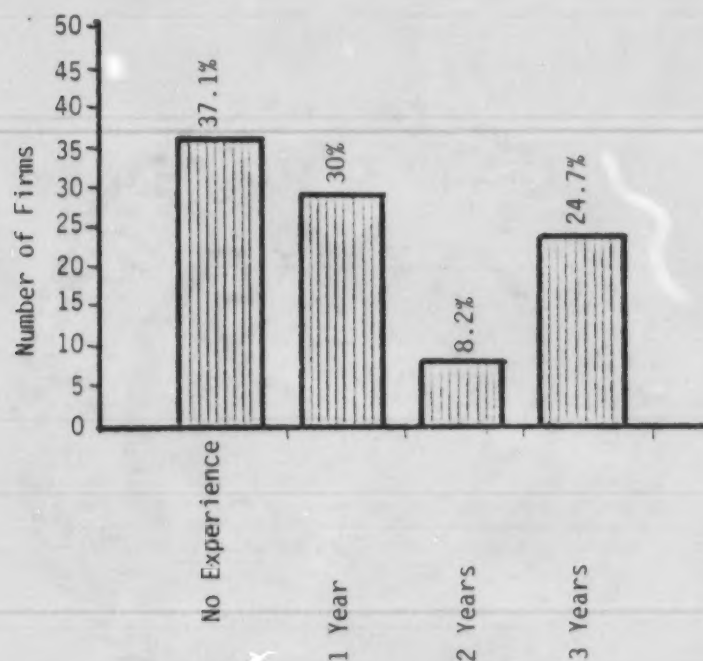


figure 5-2a PRIOR EXPERIENCE PREFERRED BY THE PLASTIC INDUSTRY FOR THE MACHINE OPERATOR

amount of prior experience the responding plastics firm would expect the machine operator to have. Thirty-six (36) or 37.1 percent do not expect the prospective employee to have any prior experience. Twenty-nine (29) or 30 percent expect the machine operator to have a minimum of one year of experience in the similar occupation before the start of

their service, but only eight (8) or 8.2 percent expect two years of experience and twenty-four (24) or 24.7 percent expects three or more years of prior experience before they would employ a machine operator.

The Missouri Plastic Industry has responded to the survey that nine (9) or 12.7 percent expect to employ their set-up person without any prior experience for the job classification, figure 5-2b. Twenty-two (22) or 31 percent

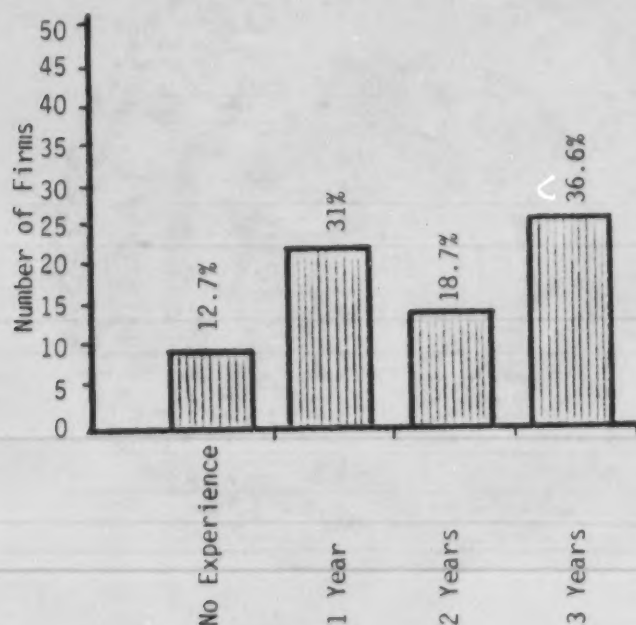


figure 5-2b PRIOR EXPERIENCE PREFERRED BY THE PLASTIC INDUSTRY FOR THE SET-UP PERSON

of the respondents would expect their prospective employees to have a minimum of one year of experience. Fourteen (14) or 19.7 percent two years, and twenty-six (26) or 36.6 percent would be expected to have three or more years of

prior experience before entering their firm's employ.

The mold maker is required to have a high degree of skill, figure 5-2c reports that only three (3) or 4.9 percent

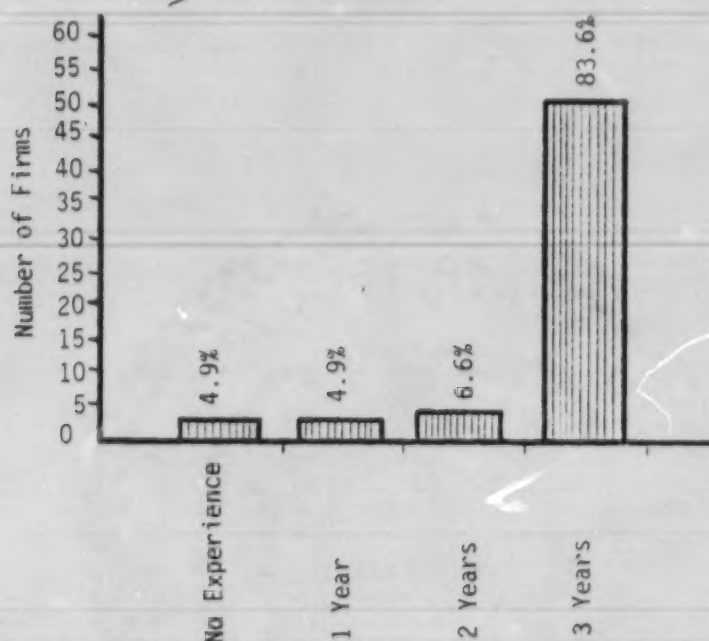


figure 5-2c PRIOR EXPERIENCE PREFERRED BY THE PLASTIC INDUSTRY FOR THE MOLD MAKER

would require one year of prior experience and only four (4) or 6.6 percent would require two years prior experience in mold making. However, fifty-one (51) or 83.6 percent of the respondents expect their prospective mold makers to have a minimum of three years prior experience in the trade before they would be considered for employment.

Seven (7) or 13.5 percent of the respondents to the survey would employ a technician without prior experience

in that job classification and seven (7) or 13.5 percent also would require their technician to have at least one year or prior experience in that job classification, figure 5-2d. Of those responding to the survey item, seven (7) or

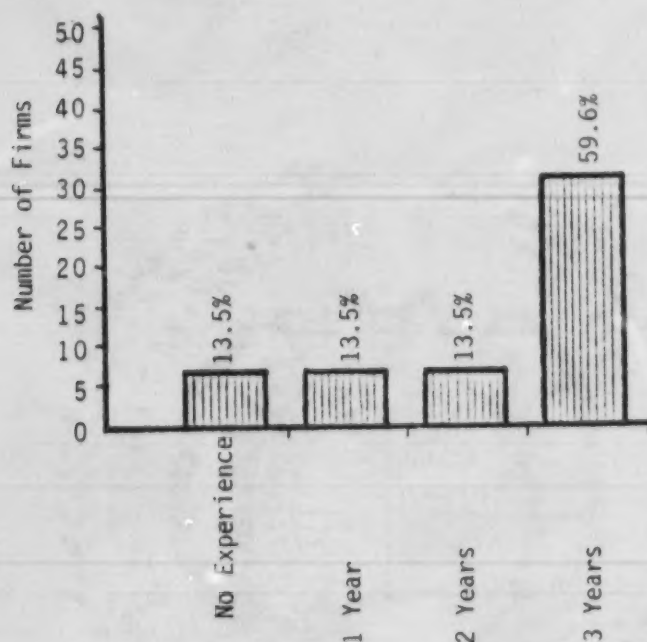


figure 5-2d PRIOR EXPERIENCE PREFERRED BY THE PLASTIC INDUSTRY FOR THE TECHNICIAN

13.5 percent would prefer their future plastic technicians to have a minimum of two years experience and a strong thirty-one (31) or 59.6 percent are going to require a minimum of three years of prior experience in the technician classification.

Those firms responding to the "prior experience" required item have indicated that there are only four (4)

or 5.8 percent firms who would employ an engineer having no prior experience, figure 5-2e. Three (3) or 4.2 percent

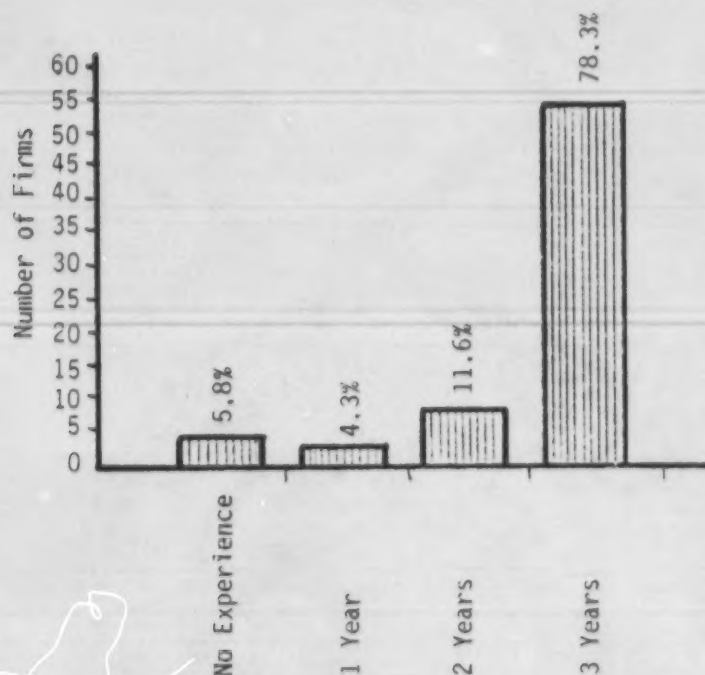


figure 5-2e PRIOR EXPERIENCE PREFERRED BY THE PLASTIC INDUSTRY FOR THE ENGINEER

responded they would employ an engineer with only one year experience. Eight (8) or 11.6 percent would employ an engineer with only two years. The remainder of the respondents, fifty-four (54) or 78.3 percent gave positive indication that they would expect an engineer to have a minimum of three years of prior experience in the field of plastics engineering.

The advisory panel suggests, with the strong response toward at least three years of prior experience for the

technician and a significant response for the set-up person of three years of experience, that this is evidence that pre-employment training could help assist students make the transition into the plastics industry. Pre-employment training could shorten, if not eliminate, the length of time necessary to achieve the prior experience expected by the plastics industry today.

Plastics Pre-training Knowledge Expected in the Work Force. Certain knowledges are always apparent for any vocation, and the plastics industry is no different. The various job classifications will require varying levels of a variety of knowledges to accompany the skills. The plastics firms responding to the survey item indicated by five (5) or 2.1 percent of the responses that molecular chemistry was a necessary basic knowledge for employment in the plastic industry, figure 5-3. Eighteen (18) or 7.6 percent of the respondents believe that mathematics should be an integral part of the pre-training of the plastics work force. Sixty-five (65) or 27.4 percent of the firms responding indicated that information about the types of plastic and their properties should be an integral part of the prospective employee's background knowledge. Mechanical knowledges (principles of hydraulics and electrical sciences) were indicated by eighty-three (83) or 35.0 percent of the responding firms as important to the future employee and

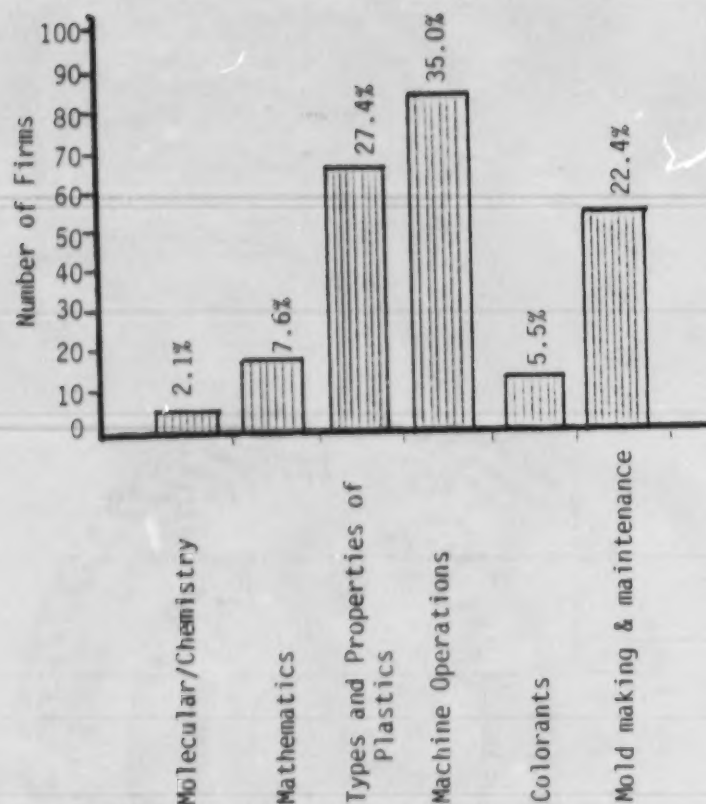


figure 5-3 PRE EMPLOYMENT KNOWLEDGES THE PLASTIC INDUSTRY EXPECTS OF ITS PERSPECTIVE EMPLOYEES

thirteen (13) or 5.5 percent agree that knowledge of colorants were important. Those firms responding, fifty-three (53) or 22.4 percent, have agreed positively that mold making and mold maintenance should be a part of the pre-training program for future employees of Missouri's plastic industry.

Summary

Job experience is not a high item of concern for employees seeking the classification of machine operators.

Job experience is a priority factor when employing mold makers, set-up persons, technicians and engineers. However, pre-training of the personnel is preferred by a significant number of those firms responding to the questionnaire.

The source of pre-training as indicated by the survey response should be conducted predominantly by the secondary schools. The plastic industry questionnaire indicated a preference first, for employees who have completed high school and had pre-training courses in plastics and second, an employee graduating from high school with experience in a trade/technical school plastics background.

CHAPTER 6

PRODUCTION OF THE PLASTIC INDUSTRY IN MISSOURI

Most plastic materials can be processed into consumer products in any one of several different ways, depending on the product and quality required. The plastic processing is at the heart of the industry. While the processes differ, however, there are elements common to many of them. In the majority of cases, pressure, heat, and/or chemical reaction is involved. It should be recognized that there are variations in virtually every process, perhaps aimed at servicing a particular market or servicing a particular plastic, that represents some degree of deviation from the basic.

Plastic Process Basic to Missouri's Plastic Industry.

A plastic processing firm may utilize one or several forming methods. In general, a firm will specialize in one particular forming technique. Figure 6-1, represents the frequency of processes engaged in by Missouri's individual plastics' firms. Injection molding was responded to by fifty-four (54) or 25.1 percent of the firms returning the questionnaire, making injection molding the number one most frequently used process by plastic forming plants. Blow molding was identified by twenty (20) or 9.3 percent of the respondents and fiberglass reinforced lay-up was reported by ten (10) or 4.7 percent of the plastic firms reporting.

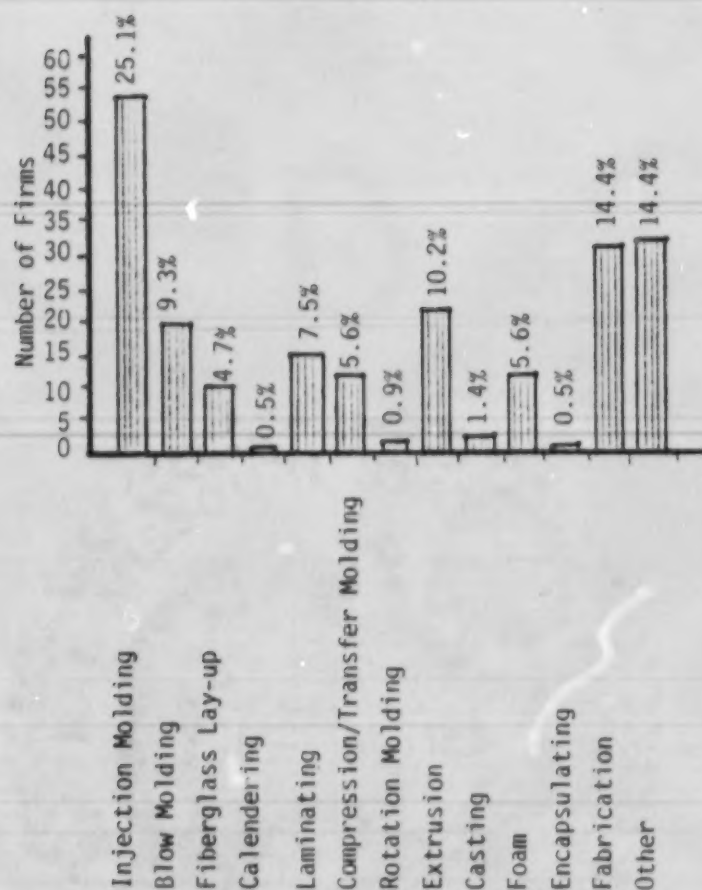


figure 6-1 PLASTIC FORMING PROCESS ENGAGED IN BY MISSOURI'S PLASTIC INDUSTRY

The calendaring process was reported by one (1) or 0.5 percent of Missouri's plastic firms. Fifteen (15) or 7.5 percent of the respondents were engaged in the process of laminating and twelve (12) or 5.6 percent were reporting the use of compression/transfer molding. Rotational molding is used by two (2) or 0.9 percent of the reporting firms.

Extrusion is very high in the national ranking of

plastic processing.¹⁵ Twenty-two (22) or 10.2 percent of Missouri's plastic firms responding to the questionnaire indicated extrusion as a processing form they are engaged in. Three (3) or 1.4 percent are engaged in a form of casting plastics. Also, twelve (12) or 5.6 percent of the reporting firms are forming plastic products.

The Encapsulating process is being performed by one (1) or 0.5 percent of the responding plastic firms of Missouri. Thirty-one (31) or 14.4 percent of the respondents were engaged in fabrication of plastic products. The category of "other" was responded by thirty-two (32) or 14.9 percent. Most of the responses in this case were write-ins of the thermo forming family of processes.

The Family of Plastics Used by Missouri's Plastic Industry. Plastics are a family of materials, not a single material, each member of which has its own distinct and special advantages. Whatever their properties or form, most plastics fall into one of two groups, thermoplastics or thermosets. Reported in Table IV is the ranking of the types of plastic used by the responding firms of Missouri's plastic industry. Polyethylene being the most frequently used plastic of the thermoplastic family by the Missouri plastic industry responding to the questionnaire. Polyure-

¹⁵ _____, "Materials 1980: The Outlook for Materials, Supplies and Prices." Modern Plastics, January 1980, pp. 71-108.

TABLE IV

Type of Plastic Material Used by the Missouri Plastic Industry

Thermoplastic		Thermosetting	
Polyolefins	8	Polyurethane	16
Polyethylene		Polyester	12
L.D.	44	Phenolics	5
H.D.	18	Melamines	5
Acrylonitrile-butadiene- styrene (ABS)	34	Epoxy	4
Polyvinyl Chloride	31	Alkyds	3
CPVC	2	Silicone	2
Polystyrene	30	Other	8
Nylon	23		
Polypropylene	21		
Polycarbonate	20		
Acrylics	15		
Styrene Acrylonitrile (SAN)	5		
Other	16		

thane was the leading response for the thermosetting family by Missouri's plastic firms.

Future Outlook for Plastic Industry Growth by Man-hours of Production. Does Missouri's plastic industry expect an increase in production by basic man power hours? Ten (10) or 9.3 percent of the firms reporting expected a decline in man hours of production, figure 6-2. While seventy (70) or

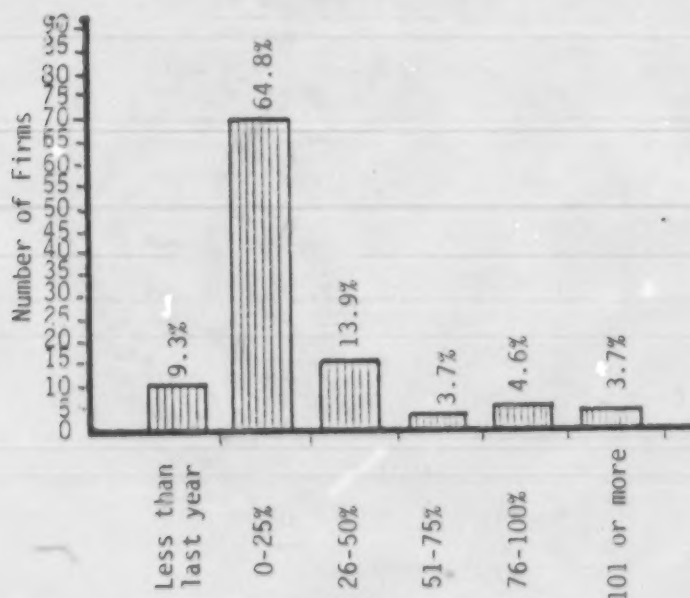


figure 6-2 EXPECTED PRODUCTION INCREASE IN MAN HOURS FOR NEXT YEAR OVER THE PRESENT YEAR

64.8 percent of the respondents expect an increase of from 0-25 percent of the man hours generated. These data are consistent with the response to the reporting firms future

expansion plans, as indicated in figure 3-4.

Fifteen (15) or 13.9 percent of the respondents indicate an increase of 26 to 50 percent of their man hour production and four (4) or 3.7 percent indicated their future plans will be to increase production by 51 to 75 percent. Five (5) or 4.6 percent have plans to increase their man hour rate by 76 to 100 percent. Four of the responding firms of Missouri's plastic industry reported the intention to increase man hour production by 101 percent or more.

Summary

The most frequently used plastic process as reported by the Missouri plastic industry was injection molding. Fabrication, extrusion and blow molding being close for the second most frequently used plastic process engaged in the State's plastic industry.

Many types of plastics are being formed by the plastic industry of Missouri. However, the polyethylene's supercede, by frequent count, the number of any other plastic used in Missouri at the date of this report. The thermoplastic family outnumbers the thermosetting family as the most used family of plastics. Polyurethane is the most frequently used thermosetting resin of Missouri's plastic industry.

Most of the plastic firms reporting gave evidence of their intentions to increase man hours produced within the

next year, proof of the vitality of this industry in Missouri.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

Three hundred and fifty-five plastics firms were identified to be representatives of the plastic industry in Missouri. Responses were collected from 129 of the original 355 for a 36 percent return. This 36 percent represents the data base for presentation of these data.

Conclusions

Of the responding firms, St. Louis and Kansas City metro areas have the greater concentration of plastic firms. The Southeast quadrant of the state presented the larger number of participating plastic survey forms than any other out-state region.

The average plastic firm forms over 3,081,223 pounds of plastic per year.

It is evident that women contribute heavily to the labor force of the plastic industry. There is probably a greater potential for female employment in the plastic industry than is currently realized by those who seek employment.

The plastic industry, as a result of automation is not heavily dependent on the work force for production. Of the responding plastics' firms, 44 percent indicated their numbers of employees to be fewer than twenty-five (25). Over 50 percent of the responding plastic firms have indicated

that they plan for expansion of their plastic's production facilities.

The plastic industry of Missouri has expressed that their greatest manpower need is for the job classification of machine operator. Their most frequently used method of satisfying this need is by up-grading in-plant personnel for that position. For those plants planning future expansion, the machine operator was also judged to be the most critical man power need.

The machine operator, set-up person and mold maker were predominately compensated by the hourly wage. Compensation for these classifications are between \$3.00 and \$5.00 per hour for the entry level job. The technician and engineer are predominately salaried positions with two intervals being used, \$12,000 to \$15,000 and greater than \$22,000 per annum for the entry level salaries.

Job experience is not a high item of concern for the employer who is seeking to employ a machine operator. However, job experience is a high priority for the employer who is seeking personnel for mold making, set-up person, technician and engineer.

Pre-training of employees through the public schools are preferred by most employers. The survey responses concluded that the ideal employee for entry level job should be graduates of: (1) traditional high school with a course or courses in plastics or (2) trade/technical school with a

plastics background. Pre-training knowledges indicated by the responding firms are; in rank order, (1) machine operator, (2) types of plastics and their properties, (3) mold making and maintenance, (4) mathematics, (5) colorants and (6) molecular chemistry.

Missouri's plastic industry's most frequently used forming process is injection molding, followed by fabrication, extrusion and blow molding.

Plastics families and types most frequently used are: the thermoplastic, polyethylene is most frequently named plastic. The total family of thermoplastics supercede the thermosets by approximately 2 to 1 ratio. The most frequently used thermosetting plastic is polyurethane.

Most of the plastic firms reporting gave evidence of their intentions to increase their man-hours produced within the next year, proof of the vitality of this Missouri industry.

Recommendation

Since the plastic industry is well grounded in the state with a wide geographical base. Since it is contributing heavily to the employment security of the citizens of this state. Since the industry has indicated intentions of expansion in this role of employment. Since the industry contributes significantly to the general economy of the state as stated with these data presented by the plastic

industry of Missouri and reported in this document the following recommendation is made.

That the State Department of Education for the State of Missouri lend its resources and expertise to assist the local educational systems with the development and promotion of programs to provide the pre-training courses necessary for the student, who desires to gain knowledges and skills for entry-level employment in the plastic industry.

It is further recommended that an articulated program be considered for the traditional high school, trade/technical, and/or area vocational schools. The teacher education institutions should be articulated into the total scheme to provide teachers who can be utilized to provide leadership at the local level.

ADDENDUM

During the second and last session of the advisory panel of experts, it was suggested that the Researcher compile information which would reveal the numbers and significance of employment of the plastics industry in Missouri. It was the advisory panel's suggestion that the Graphics industry be used as the comparative base. To further compare, the Researcher also added statistics of the woods industry within the state of Missouri. The results of this information are reported in the Addendum Table.

Addendum Table

Employees of the Wood, Graphics, Plastics Industry of Missouri*

Wood's Industry	Graphic's Industry	Plastic's Industry
28,757	53,241	66,847

*The numbers reported here were derived from data presented in the Missouri Directory of Manufacturing and Mining.

The woods/lumbering industry includes logging, lumber manufacture and other primary wood industries. It does not include construction/carpentry/cabinetmaking or furniture making industries. The figures presented for the Graphics industry includes newspaper, lithography and platemaking, but does not include photography. The plastic industry

figures includes the primary manufacture of plastic and all processing plants but does not include sales or distribution of plastic products.

APPENDIX A
Missouri Plastic Industry Survey Form

To return this form upon completion:

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1. Fold and place in the self-addressed stamped envelope and drop in mail.

Survey Code Number _____

Records:

To help us with the internal control of the survey, your company has been assigned a code number. The company code number is printed above and registered in our office. Your returned survey will be treated with the utmost confidentiality. This will be used solely to:

- a. Identify those companies that have not responded to the initial mailing and to formulate a second mailing or the third telephone survey.
- b. Enable categorization of study results by geographical location.

Missouri Plastics Industry Survey

Instructions:

The mechanics of this survey has been made as simple as possible, requiring for the most part, only a check (✓) mark in the appropriate square ☐. This should only take a few minutes of your valuable time.

1. Respond to all items as they relate to your company. If you are unable to provide information on all topics, you may wish to consult with other members of your firm.
2. If the industrial classification and production areas are not identical with those used by your company, please use the classification which most nearly match and respond to the items accordingly.
3. When responding to a category marked other, please identify the specific item involved.
4. Please complete the form and return it as soon as possible.

1. How many persons are employed by your firm which contribute to the plastics industry work force:

- | | |
|----------------------------------|---|
| ☐ 1 - 25 | ☐ 76 - 100 |
| ☐ 26 - 50 | ☐ 101 - and over |
| ☐ 51 - 75 | |

2. What is the percentage of the plastic related employees to your total work force:

- | | |
|-----------------------------------|------------------------------------|
| ☐ 1 - 25% | ☐ 51 - 75% |
| ☐ 26 - 50% | ☐ 76 - 100% |

3. What percentage of your plastic work force are female employees:

- | | |
|-----------------------------------|------------------------------------|
| ☐ 1 - 25% | ☐ 51 - 75% |
| ☐ 26 - 50% | ☐ 76 - 100% |

4. Does your firm generally use the following job classification when hiring personnel for plastics related jobs:

	YES	NO	IF NO, PLEASE LIST
Supervisor/Foreman	☐	☐	_____
Machine Operator	☐	☐	_____
Set-up Person	☐	☐	_____
Mold Maker	☐	☐	_____
Technician	☐	☐	_____
Engineer	☐	☐	_____

5. In your unbiased opinion, who do you feel makes the better employee, if properly qualified for:

	MALE	FEMALE	NO DIFFERENCE
Machine Operator	☐	☐	☐
Set-up Person	☐	☐	☐
Mold Maker	☐	☐	☐
Technician	☐	☐	☐
Engineer	☐	☐	☐

6. If your firm uses the classification of "Technician" would you please define the type and duties, (if no, go to item 7).

7. What job level does your firm have the most difficulty in hiring qualified personnel:

☐ Machine Operator	☐ Technician
☐ Set-up Person	☐ Engineer
☐ Mold Maker	☐ No particular difficulty in any category

8. What is your prediction about the future labor supply for the next ten years:

☐ Short supply	☐ Surplus of labor
☐ Just about equal	

9. Does your firm plan future expansion of its plastics manufacturing:

☐ Yes	☐ No commitment at this date
☐ No	

10. What job classification will be needed to fulfill your firm's intended expansion plans:

☐ Machine Operator	☐ Technician
☐ Set-up Person	☐ Engineer
☐ Mold Maker	☐ Other _____

11. From what source does your firm hire plastic personnel:

☐ Other plastic processors	☐ Suppliers
☐ Outside the plastic industry	☐ Customers
☐ Schools and Colleges	☐ Other _____
☐ Within the Company	

12. Which type of pre-training would your firm prefer its prospective plastics work force to have:

☐ Non-high school graduates willing to learn
☐ High school graduates with no special plastics training
☐ High school graduates with plastics training
☐ Trade/technical school
☐ College graduate

13. Would you prefer the future employee to have job experience of:

NONE	1 YEAR	2 YEARS	3 YEARS	
☐	☐	☐	☐	Machine Operator
☐	☐	☐	☐	Set-up Person
☐	☐	☐	☐	Mold Maker
☐	☐	☐	☐	Technician
☐	☐	☐	☐	Engineer

14. Please identify the plastic manufacturing process(es) your firm engages in:

77

- | | |
|---|--|
| ☐ Injection molding | ☐ Rotational molding |
| ☐ Blow molding | ☐ Extrusion |
| ☐ Fiberglass lay-up | ☐ Casting |
| ☐ Calendering | ☐ Foam (open or close cell) |
| ☐ Laminating | ☐ Encapsulating |
| ☐ Compression/transfer molding | ☐ Fabrication |
| ☐ Other _____ | |

15. Knowledges you would like your work force to gain through a pre-training program:

- | | |
|---|---|
| ☐ Molecular Chemistry | ☐ Machine Operation (hydraulic and electrical) |
| ☐ Mathematics | ☐ Colorants |
| ☐ Types of Plastics and Properties | ☐ Mold Making and Maintenance |

16. The following items relate to the compensation paid to plastic personnel according to job title:

	SALARIED	WAGED
The machine operator is	☐	☐
The set-up person is	☐	☐
The mold maker is	☐	☐
The technician is	☐	☐
The engineer is	☐	☐

17. Entry Salaries: (Based on your firm's 1981 hiring practices)

- | HOURLY | SALARIED |
|---|--|
| ☐ Less than \$3.00 | ☐ Less than \$8,000 |
| ☐ 3.00 - 5.00 | ☐ 8,000 - 10,000 |
| ☐ 5.00 - 7.00 | ☐ 10,000 - 12,000 |
| ☐ 7.00 - 9.00 | ☐ 12,000 - 14,000 |
| ☐ 9.00 - 11.00 | ☐ 14,000 - 16,000 |
| ☐ 11.00 - 13.00 | ☐ 16,000 - 18,000 |
| ☐ 13.00 - 15.00 | ☐ 18,000 - 20,000 |
| ☐ 15.00 - or greater | ☐ 20,000 - 22,000 |
| | ☐ 22,000 - or greater |

18. List the number of approximate pounds of plastic material used by your firm last year: _____

19. Type of plastic used in your manufacturing processes: (please list the family of plastics)

THERMOPLASTICS	THERMOSETS
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

20. Expected plastic production output for the future year over the present year in manpower hours.

- | | |
|--|-------------------------------------|
| ☐ Less than last year | ☐ 51 - 75% |
| ☐ 0 - 25% | ☐ 76 - 100% |
| ☐ 26 - 50% | ☐ 101 - more |

Thank you for your time and expertise.

APPENDIX B

Advisory Panel of Experts

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APPENDIX C

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Mr. Roy Chervenec, Pres.
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ph. (314) 221-0242

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Division
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Harrisonville, MO 64701
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International Shoe Co.
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ph. (314) 243-8154

Mr. Wayne Decamp, Mgr.
Edward Spence Co.
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Jackson, MO 63755
ph. (314) 243-8437

Mr. Art Retsema, Plant Mgr.
Chesebrough-Ponds, Inc.
Box 1047, N. Ten-Mile Drive
Jefferson City, MO 65101
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Hubbs Artificial Flowers
Star Route 8 Box 47
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Ms. Leona Lansford, Plant Manager
L. B. Mfg. Co.
Iberia, MO 65486
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Norman Kraft, Plt. Mgr.
Brown Shoe Co., Inc.
350 N. Hancock
Ironton, MO 63650
ph. (314) 546-2015

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Lenco, Inc.
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Jackson, MO 63755
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AB Chance Co., Plastics Plant
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Manager
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Centralia, MO 65240
ph. (314) 682-5521

Mr. Harry Heflin, Mgr.
Clow Corporation
6500 Paris Road
Columbia, MO 65201
ph. (314) 474-8511

Mr. Bud N. Doran, Pres.
Brookfield Plastics Container
Inc.
Hwy. 37 South
Brookfield, MO 64628
ph. (816) 258-3025

Mr. Ben Capshaw, V. Pres.
Atlast Plastic Corp.
220 Broadview
Cape Girardeau, MO 63701
ph. (314) 335-5504

Mr. Richard D. Dunlap, Pres.
Dunlap Industries Inc.
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Mr. Jerry Watley, Pres.
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Billings, MO 65610
ph. (417) 744-2925

Mr. Harold Gallaher, Pres.
Echols, S. T. Inc.
1013 W. main St., Box 6
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Mr. Sam Lamke
The Kellwood Company
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Mr. Schwartz, Manager
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Benchmark Tool Div.
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Mr. Rex M. Keys
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Automated Gasket Corp.
P.O. Box 9968, 333 Santa Ave.
St. Louis, MO 63122
ph. (314) 821-4630

Mr. Bob Schultz
Bee Cabinet
3817 N. 23rd
St. Louis, MO 63107
ph. (314) 421-1234

Mr. Robert C. Riegel, Mgr.
Bemis Co., Inc. Visinet Mill
2400 S. 2nd St.
St. Louis, MO 63104
ph. (314) 664-7111

Mr. Edward L. Meiser
Brown Shoe Co.
8300 Maryland Ave.
St. Louis, MO 63105
ph. (314) 997-7590

Mr. George Ezell, V.P.
Foremost Printing Co., Inc.
1319 W. Lark Ind. Ct.
Fenton, MO 63026
ph. (314) 343-9665

Mr. Edward A. Schaeffer, Pres.
GET Plastics Inc.
611 Talcott Ave.
St. Louis, MO 63147
ph. (314) 621-3383

Mr. Eddo Herder, Owner
Gateway Dyn-a-Vac
79 May Valley Ln.
Fenton, MO 63026
ph. (314) 343-6153

Mr. John W. Ehrlen, Pres.
General Plastics Inc.
2829 Oregon Ave.
St. Louis, MO 63118
ph. (314) 664-2224

Mr. Harold O. Goad, Pres.
Goad, Rarry, & Co. Inc.
260 Old State Rd.
Ellisville, MO 63011
ph. (314) 394-6334

Mr. Martin Katz
Great Western Bag Co.
1416 North Broadway
St. Louis, MO 63102
ph. (314) 421-0498

Mr. R. Harting, Owner
Harting Enterprises, Inc.
2809 Hamilton Ave. Rear
St. Louis, MO 63125
ph. (314) 381-7080

Mr. Hamilton, Pres.
Hamilton Shoe Co.
2107 Lucas Ave.
St. Louis, MO 63103
ph. (314) 421-6030

Mr. A. J. Spanogle, Pres.
Hanley Plastics Corp.
515 Hanley Ind. Ct.
St. Louis, MO 63144
ph. (314) 781-660

Mr. Murray S. Sherman, Plt. Mgr.
GAF Corporation
9215 Riverview Dr.
St. Louis, MO 63137
ph. (314) 867-3150

Mr. Roger Hoffman, Gen. Mgr.
Gateway Microform Mfg. Inc.
13789 Ridertrail No. 110
Earth City, MO 63045
ph. (314) 291-8554

Mr. Walter Gerber, Pres.
Gerber Industries Inc.
1510 Fairview St.
St. Louis, MO 63132
ph. (314) 429-4222

Mr. James A. Paradossi, Pres.
Gravois Planing Mill Co.
3026 Juanita St.
St. Louis, MO 63118
ph. (314) 776-2800

Mr. Thomas P. Duffy, V.P.
Greenstreak Plastic Products
3400 Treecourt P.O. 7139
St. Louis, MO 63177
ph. (314) 223-9400

Mr. Jean Berry, Office Mgr.
Handicraft Co.
1009 Russell
St. Louis, MO 63104
ph. (314) 773-2980

Mr. Rick Buck, Mgr.
Airwick Pool Pds.
#4 Cermak
St. Peters, MO 63376
ph. (314) 278-5211

Plant Mgr.
Foremost Dairy
809 N. Campbell
Springfield, MO 65801
ph. (417) 869-7272

K-S-H, Inc.
10091 Manchester Rd.
St. Louis, MO 63122
ph. (314) 966-3111

Mr. Richard Kerckhoff
Pevely Dairy, Inc.
1001 S. Grand
St. Louis, MO 63104
ph. (314) 771-4400

Mr. Erwin Shaffer, Mgr.
Quick Point Pencil Co.
1717 Fenpark Dr.
Fenton, MO 63026
ph. (314) 343-9400

Mr. Lester Huck
Sealtest Foods
2001 Chestnut
St. Louis, MO 63104
ph. (314) 231-3900

Mr. Bob Korvas
Standard Pipe Protection
8474 Delport
St. Louis, MO 63114
ph. (314) 423-0600

Mr. Roy Kruse
Street Industries
1 River Road
St. Louis, MO
ph. (314) 892-2958

Mr. Gerald W. Cohern, D.P.M.
Custom Shoe Laboratories, Div.
of Podiatry Center South,
Inc.
Southside National Bank Building
St. Louis, MO 63116
ph. (314) 776-0217

Mr. Robert Ollinger, Pres.
Dow Screw Products Inc.
8620 S. Broadway
St. Louis, MO 63111
ph. (314) 638-5100

Mr. Lorenz O. Dressel, Owner
Dressel Woodworking Co.
8600 Gravois Rd.
St. Louis, MO 63123
ph. (314) 631-3232

Mr. Joe Kirtogian, Pres.
E. K. Novelty Mfg. Co.
1119 Mississippi
St. Louis, MO 63140
ph. (314) 892-7150

Mr. Karl G. Keth, Proprietor
Keth, Karl G. Co.
4258 Elm Park
St. Louis, MO 63128
ph. (314) 892-7150

Mr. Paul Flum, Pres.
Flum, Paul, Ideas Inc.
1635 Washington Ave.
St. Louis, MO 63103
ph. (314) 621-2444

Mr. Theodore Komen, Pres.
Foam-Fabricators Ltd. Inc.
316 S. 16th St.
St. Louis, MO 63103
ph. (314) 231-0802

Mr. Aaron S. Dennia, Pres.
Dennis Chemical Co.
2701 Papin St.
St. Louis, MO 63103
ph. (314) 771-1800

Mr. Karl P. Wolf, Pres.
Designs for Tomorrow, Inc.
2401 Schuetz Rd.
Maryland Heights, MO 63043
ph. (314) 432-5566

Mr. A. T. Doyle, Pres.
Doyle, A. T., Co. Inc.
2360 S. 59th
St. Louis, MO 63110
ph. (314) 647-5100

Mr. Phil Burba, Plt. Mgr.
Dynasayer, Corp.
3511 Tree Court Industrial Blvd.
St. Louis, MO 63122
ph. (314) 225-5285

Mr. Ed Caspermeyer, Owner
Ed's 3d Signs
8006 Grand Vista
St. Louis, MO 63123
ph. (314) 352-6531

Mr. Harold C. McGinnis, Pres.
Foam Products Corp.
2524 Adie Rd.
Maryland Heights, MO 63043
ph. (314) 739-8100

Mr. Jack Goldstein, Pres.
Foremost Mfg. Co., Inc.
910 Spruce St.
St. Louis, MO 63102
ph. (314) 231-9571

Mr. Harry Suzuki, V.P.
Canyon Mfg. Co.
3001 Washington Ave.
St. Louis, MO 63103
ph. (314) 535-5400

Mr. Mike Egan, Mgr.
Burkart-Randall Div. of Textron
4306 Riverline Dr.
Earth City, MO 63045
ph. (314) 567-4650

Mr. A. Ollie Bohrer, Pres.
Dainsuply Inc.
4505 Green Park Rd.
St. Louis, MO 63123
ph. (314) 892-8597

Mr. Bud Cole, Plt. Mgr.
Chase Bag Co.
5051 Southwest Ave.
St. Louis, MO 63110
ph. (314) 771-3535

Mr. Byron Lapin, V.P.
Clayton Corporations of Delaware
4205 Forest Park Ave.
St. Louis, MO 63108
ph. (314) 535-6226

Mr. Marvin Levy, Pres.
Contico International Inc.
1101 N. Warson Rd.
St. Louis, MO 63132
ph. (314) 997-5900

Mr. D. D. Blades, Pres.
Crown Plastics Inc.
2445 Northline
Maryland Heights, MO 63043
ph. (314) 567-1566

Mr. Lawrence T. Hickey, Pres.
Burkart, A Div. of Textron Inc.
511 Withers St.
St. Louis, MO 63147
ph. (314) 421-3500

Mr. Robert G. Klump, Pres.
Cardinal Paint Corporation
2533 Sullivan Ave.
St. Louis, MO 63107
ph. (314) 421-6006

Mr. Hy Velhoff, Pres.
Central States Diversified
5221 Natural Bridge
St. Louis, MO 63115
ph. (314) 261-8000

Mr. Charles E. Block, Pres.
Caribee Stamp Co.
335 Lemay Ferry Rd.
St. Louis, MO 63125
ph. (314) 638-4015

Mr. Karl Gottschalk, Pres.
Contour Cutting Corp.
9789 Reavis Park Dr.
St. Louis, MO 63123
ph. (314) 631-6300

Mr. Roland Koenig, Pres.
Crown Products Corp.
309 N. 17th Dr.
St. Louis, MO 63103
ph. (314) 421-3333

Mr. Bobby Miner, Pres.
Industrial Rack Co.
1012 N. First St.
St. Louis, MO 63102
ph. (314) 436-5034

Mr. A. W. Willert, Jr., Pres.
Irwin-Willert Co.
4044 Park Ave.
St. Louis, MO 63110
ph. (314) 772-2822

Mr. Ed Hamilton, Plt. Mgr.
Jones & Vining Inc.
3506 S. Broadway St.
St. Louis, MO 63118
ph. (314) 771-3800

Mr. A. J. Koller, Pres.
Koller-Craft Plastic Products Inc.
301 Riviera Dr., Drawer K
Fenton, MO 63026
ph. (314) 343-9220

Mr. Lawrence Oshins, Pres.
Lawrence Oshins Inc. Foam Fabricating
5215 South 38th St.
St. Louis, MO 63116
ph. (314) 832-0542

Mr. M. E. Freund, Pres.
Checker Bag Co.
10655 Midwest Ind. Blvd.
St. Louis, MO 63132
ph. (314) 423-3131

Mr. R. A. Rosen, Pres.
Clean Home Products Inc.
2805 Locust Blvd.
St. Louis, MO 63103
ph. (314) 533-1790

Mr. Marvin S. Wool, Pres.
M-R Plastics & Coatings Inc.
11460 Dorsett Rd.
Maryland Heights, MO 63043
ph. (314) 291-0525

Mr. H. Grossman, Pres.
Jarold Mfg. Co., Inc.
3920 W. Pine
St. Louis, MO 63108
ph. (314) 533-2991

Mr. Paul E. Johansen, Pres.
Johansen Bros. Shoe Co., Inc.
1136 Washington
St. Louis, MO 63101
ph. (314) 231-0700

Mr. Richard S. Hawes, Pres.
KSH Inc.
1110 Reco
St. Louis, MO 63126
ph. (314) 343-9220

Mr. Karl Kopplin, Pres.
Kopplin Molding Corp.
2000 Mullanphy St.
St. Louis, MO 63106
ph. (314) 241-8873

Mr. Geo. Schumacher, Mgr.
Layayette Work Center Inc.
423 St. Louis Ave.
Valley Park, MO 63088
ph. (314) 225-6747

Mr. E. Stoff, Pres.
Locust Fabricators Inc.
2822 Breckenridge Ind. Ct.
St. Louis, MO 63144
ph. (314) 961-1526

Mr. George W. Mabie, Pres.
Mabie Vac Formed Plastics Inc.
3640 Weber Rd.
St. Louis, MO 63125
ph. (314) 638-6666

Mr. Joseph G. Longstreth, Pres.
Poly-Quipment Inc.
2829 S. Brentwood
St. Louis, MO 63144
ph. (314) 968-1162

Mr. H. McNally, Pres.
Premier Packages Inc.
9438 Watson Industrial
St. Louis, MO 63126
ph. (314) 961-6588

Mr. Frank E. Proctor, Pres.
Proctor Products Inc.
288 Hanley Ind. Ct.
St. Louis, MO 63144
ph. (314) 781-5204

Mr. Thomas A. Bagwell, Pres.
Progressive Pattern Co.
2141 January Ave.
St. Louis, MO 63110
ph. (314) 647-0859

Mr. J. M. Flores, Plt. Mgr.
Owens-Illinois, Inc.
2122 Hereford
St. Louis, MO 63110
ph. (314) 664-8390

Mr. D. L. Davenport, Pres.
Pan American Industries
2828 Brannon Ave.
St. Louis, MO 63139
ph. (314) 771-0777

Mr. Allen A. Suellentrap, V.P.
Lemay Machine Co., Inc.
4725 Green Park Rd.
St. Louis, MO 63123
ph. (314) 892-8080

Mr. George L. Fonyo, Pres.
MFG Associates Inc.
603 Hanley Ind. Ct.
St. Louis, MO 63144
ph. (314) 647-8750

Mr. Richard T. Harvey, Gen. Mgr.
Plastics Moulding Co., Inc.
4211 N. Broadway
St. Louis, MO 63147
ph. (314) 241-2479

Mr. J. B. Craven, Plt. Mgr.
Purex Corp.
6506 N. Broadway
St. Louis, MO 63147
ph. (314) 382-8535

Mr. M. A. Greenberg, Pres.
Republic Bag Co.
2508 N. Broadway
St. Louis, MO 63102
ph. (314) 421-3700

Mr. Harry Rosenberg, Pres.
Ritepoint Division, Penn Corp.
1733 Gilsinn Ln.
Fenton, MO 63026
ph. (314) 343-4400

Mr. Edward R. Spence, Pres.
River Plastics Inc.
10315 Page Ind. Blvd.
St. Louis, MO 63132
ph. (314) 426-6500

Mr. Jim Lauber, Exec. V-Pres. of
Oper.
Roll-O-Sheets Inc.
1831 Avenue H.
St. Louis, MO 63125
ph. (314) 865-1966

Mr. Edsel Safron, Pres.
Pillow Manufacturing Co.
134 Branch St.
St. Louis, MO 63147
ph. (314) 231-3340

Mr. Norman Litz, Pres.
Plasco, Div. of Nirdorff Krein Mfg.
Co.
1441 N. Warson
St. Louis, MO 63132
ph. (314) 426-3388

Mr. George M. Martin
Plasti-Lite Signs
8800 Raleigh Dr.
St. Louis, MO 63132
ph. (314) 843-4888

Mr. Jay Shah, Owner
Shady Dyn-A-Vac Sign Company
1816 Strathearn Ct.
St. Louis, MO 63141
ph. (314) 434-6192

Mr. Don Kessler, Pres.
Shu-Plate Inc.
10490 Baur Blvd.
St. Louis, MO 63132
ph. (314) 997-0662

Mr. Robert S. McDorman, Pres.
Mac Molding Co., Inc.
12814 Gravois Rd.
St. Louis, MO 63127
ph. (314) 849-0646

Mr. Philip B. Cady, Pres.
Magna Visual Inc.
1200 N. Rock Hill Rd.
St. Louis, MO 63124
ph. (314) 962-9804

Mr. N. K. McKittrick, Owner
McKittrick N. K. Co., Inc.
1721 S. 7th St.
St. Louis, MO 63104
ph. (314) 426-1089

Mr. Edward S. Samuels, Pres.
Samuels Shoe Co.
4940 Northrup Ave.
St. Louis, MO 63110
ph. (314) 865-1966

Mr. H. G. Blu, Sales Mgr.
Scientific Lighting Products
10545 Baur, Warsom Comp.
St. Louis, MO 63132
ph. (314) 997-2408

Mr. Charles F. Voelkel, Pres.
Semco Plastics Co., Inc.
1366 Kingsland Ave.
St. Louis, MO 63133
ph. (314) 863-2122

Mr. Robert F. Elzemeyer, Pres.
Service Paper Box Co.
1024 S. Vandeventer Ave.
St. Louis, MO 63110
ph. (314) 535-2202

Mr. John G. Goessling, Pres.
Missouri Knife Co. Inc.
1717 Fenpark Dr.
Fenton, MO 63026
ph. (314) 343-9400

Mr. Dick Coates
Monsanto Westport Plant
2337 Centerline
St. Louis, MO 63141
ph. (314) 694-2115

Mr. William R. Gould, Pres.
National Graphics Inc.
2711 Miami
St. Louis, MO 63139
ph. (314) 481-0134

Mr. Robert C. Ray, Mgr.
New England Lead Burning Co.
4975 Fyler Ave.
St. Louis, MO 63139
ph. (314) 481-0134

Mr. Andrew L. Depke, Pres.
Midwest Woodworking & Fixture Corp.
11634 Gravis Rd.
St. Louis, MO 63126
ph. (314) 843-3001

Mr. Carmello Migneco, Owner
Micneco Sporting Goods
374 Kinswood Lane
St. Louis, MO 63129
ph. (314) 862-3148

Mr. S. Lerman, Pres.
Milbern Foam Products Co.
7444 Forsyth Blvd.
Clayton, MO 63105
ph. (314) 862-6400

Mr. R. H. Slosberg, Pres.
Missouri Heel Co.
4067 Folsom Ave.
St. Louis, MO 63110
ph. (314) 664-5100

Mr. H. J. Mercer, Pres.
Southwest Plastic Binding Co.
123 Weldon Pkwy-Prod. West
Maryland Heights, MO 63043
ph. (314) 569-3220

Mr. M. A. Greenberg
St. Louis Bag Co.
2508 N. Broadway
St. Louis, MO 63102
ph. (314) 231-3566

Mr. John G. Goessling, Pres.
St. Louis Plastic Moulding Co.
4605 Olive St.
St. Louis, MO 63108
ph. (314) 361-5410

Mr. Francis H. Bandy, Pres.
Standard Artificial Limb Co., Inc.
1904 Olive St.
St. Louis, MO 63103
ph. (314) 231-1156

Mr. John Boner, Pres.
O'Brien Glen Partition Co.
4975 Fyler Ave.
St. Louis, MO 63139
ph. (314) 481-0134

Mr. John P. Murphy, Gen. Mgr.
Ocean Plastics Inc.
10441 Midwest Ind. Blvd.
St. Louis, MO 63132
ph. (314) 426-6500

Mr. G. F. Knollmeyer, Plt. Mgr.
Monsanto Company
1700 S. Second St.
St. Louis, MO 63177
ph. (314) 694-4000

Mr. Herman H. Pollien Tool &
Mold Co.
2392 Centerline Ind. Dr.
Pollien Tool & Mold Co.
St. Louis, MO 63141
ph. (314) 567-1120

Mr. B. G. Robert, Pres.
Siegel-Rovert Plating Co.
8645 S. Broadway St.
St. Louis, MO 63111
ph. (314) 638-8300

Mr. Vincent T. Gorguze, Chairman
Sinclair & Rush, Inc.
6900 S. Broadway St.
St. Louis, MO 63111
ph. (314) 481-2450

Mr. R. R. Will, Pres.
Willco Plastics Inc.
918 S. 4th St.
St. Louis, MO 63102
ph. (314) 241-2490

Mr. Judson N. McDougall, Dist.
Mgr.
Zonolite Construction Products
1705 Sulphur Ave.
St. Louis, MO 63110
ph. (314) 645-8786

Mr. J. Gyaki, Pres.
Swan Engineering Inc.
6261 Knox Ind. Dr.
St. Louis, MO 63139
ph. (314) 781-6633

Mr. Carl J. Tabor, Pres.
Tabor Plastic Co.
2817 Park Ave.
St. Louis, MO 63017
ph. (314) 773-6509

Mr. F. L. Hawes, Pres.
Tetra Plastics, Inc.
15 Mercury Blvd.
St. Louis, MO 63107
ph. (314) 532-3655

Mr. Herbert Greenberg, Pres.
United Bags, Inc.
2516-22 N. Broadway St.
St. Louis, MO 63102
ph. (314) 421-3700

Mr. Jacob Van Dyke, Pres.
Western Textile Products Co.
3400 Treecourt, P.O. Box 7139
St. Louis, MO 63177
ph. (314) 225-9400

Mr. R. White, Owner
White R. M. Associ. Inc.
5231 Northrup
St. Louis, MO 63110
ph. (314) 771-2240

Mr. William Wolff, Pres.
Wolff Shoe Mfg. Co.
800 N. Oak
Union, MO 63084
ph. (314) 583-2502

Ms. Jan Trotter, Mgr.
Quality Industries of The Lake of
The Ozarks
300 N. Monroe
Versailles, MO 65084
ph. (314) 378-6122

Mr. Walter Gerber, Pres.
Gerber Industries Inc.
1 Gerber Industrial Dr.
St. Peters, MO 63376
ph. (314) 278-5710

Mr. Carl E. Schaefer, Res. Mgr.
Georgia Pacific General Pass
Book Operations
40 Merchants
St. Genevieve, MO 63670
ph. (314) 883-3521

Mr. Nuton, Gen. Mgr.
Fashion Shoe Products Inc.
10 North Clark St.
Sullivan, MO 63080
ph. (314) 468-4526

Mr. Robert Isbell, Pres.
Holloway Ind. Inc.
RR1 Box 373
Sullivan, MO 63080
ph. (314) 627-3271

Mr. Robert H. Dieckhaus, Pres.
Meramec Industries Inc.
338 Ramsey St.
Sullivan, MO 63080
ph. (314) 468-3103

Mr. John S. Dickson, Gen. Mgr.
Weber Shoe Co., Inc.
P.O. Box 100
Tipton, MO 65081
ph. (816) 433-5511

Mr. John E. Fraser, Pres.
Fraser Shoe Co. Inc.
Union, MO 63084
ph. (314) 583-2311

Mr. Karl G. Selberg, Jr.
The Selless Company
123 Millwell Dr.
Maryland Hgts., MO 63043
ph. (314) 291-0445

Mr. Joseph Hickman
Aquarius Plastics Corp., Div.
of Kellwood Co.
2nd & Rand
Washington, MO 63090
ph. (314) 239-7876

Mr. Vernon Eisenbath, Opr. Mgr.
Exxon Chemical Co.
109 W. Koenig St.
Wentzville, MO 63385
ph. (314) 327-6255

Mr. Harold F. Baker, Pres.
Ideal Plastics Corp.
P.O. Box 66
Williamsville, MO 63967
ph. (314) 998-2390

Mr. Joseph E. Berry, Pres.
Barry Sales Engineering
122 N. Kirkwood Rd.
St. Louis, MO 63122
ph. (314) 821-2525

Mr. Thomas Sullivan, Mgr.
Cadillac Plastic
8680 Olive St.
St. Louis, MO 63132
ph. (314) 991-1790

Mr. Dwight Cope
Cope Plastics Inc.
6340 Knox Industrial Dr.
St. Louis, MO 63139
ph. (314) 644-5120

Mr. R. E. Goff, Gen. Mgr.
Jim Walter Plastics
Union Ind. Park P.O. Box 410
Union, MO 63084
ph. (314) 583-2583

Mr. Robert D. Borgford
The Polymer Corp.
1750 S. Brentwood
St. Louis, MO 63144
ph. (314) 962-9574

Ms. Jean Conway, Mgr.
ACZ Plastics Inc.
3943 W. Pine Blvd.
St. Louis, MO 63108
ph. (314) 534-6503

Mr. P. J. Gund, Pres.
Gund Co., Inc.
6403 Maple Ave.
St. Louis, MO 63130
ph. (314) 862-1650

Mr. Charles Armistead
Manchester Packaging Co.
St. James Industrial Part East
St. James, MO 65550
ph. (314) 699-4209

Mr. Robert Nagel, Pres.
Nagel & Nax Inc.
10907 Manchester Rd.
St. Louis, MO 63122
ph. (314) 966-2727

Mr. Bob Miller
Midwest Bolt & Supply Co.
3615 Gardner
Kansas City, MO 64120
ph. (816) 483-7880

Mr. Al Koller
Paramount Metalizing Co.
Service Road
Sullivan, MO 63080
ph. (314) 486-3181

Mr. Chris Wilde, Pres.
St. Louis Custom Fiberglass Inc.
P.O. Box 486 B, Rt.
Eureka, MO 63025
ph. (314) 962-9574

Mr. Thomas B. Moore, Pres.
Thomas B. Moore Co. Inc.
32 Progress Highway
Maryland Heights, MO 63043
ph. (314) 434-6844

Mr. Phil McKensie
Georgia-Pacific Corp.
40 Merchant St.
St. Genevieve, MO 63671

Ms. Shirley Dixon
Green Streak Plastics
3400 Tree Court Ind.
Kirkwood, MO 64122

Mr. Bob DeGeorge
Adept Mfg. Inc.
370 S. Main
Grookfield, MO 64628

Mr. Edward J. Walsh, Pres.
Plastic Container Company
3937 Park Ave.
St. Louis, MO 63110
ph. (314) 664-6233

APPENDIX D

PostCard

Does your firm process or fabricate plastic materials? ☐ Yes ☐ No

If yes, would your firm be willing to assist us in obtaining information about the labor force and its training to perpetuate the plastic industry in Missouri?

☐ Yes ☐ No

Please list the name of the appropriate company officer which could supply the necessary information for a forthcoming short questionnaire prepared by Dr. Jack M. Landers, Professor of Industrial Technology, Central Missouri State University for the Missouri State Department of Education.

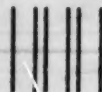
Name _____

Firm _____

Address _____

Please return immediately, Thank you.

Dr. Jack M. Landers,
Project Director, G 79
Central Missouri State University
Warrensburg, Missouri 64093



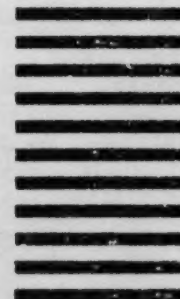
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Dr. Jack M. Landers
Project Director, G79
Central Missouri State University
Warrensburg, MO 64093



APPENDIX E
Cover Letter



Central Missouri
State University

Weirrensburg, MO 64093
816-429-4111

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Missouri Plastic Industry Survey
Jack M. Landers, Project Director

Dear Sir:

Information about the personnel requirements for Missouri's Plastic Industry and the current manpower needs is lacking. In the state of Missouri, plastic technology is not well distributed or even offered by the high schools or vocational-technical schools which could help alleviate the trained manpower shortage, if in fact it exists. At this date, no detailed data exists to substantiate plastics manpower needs of the state. Neither has a recommended curriculum guide been prepared for plastics technology instruction. Hence, the effectiveness of the education program meeting the industries needs is unknown.

In cooperation with the Research Coordinating Unit of the Missouri State Department of Elementary and Second Education and Central Missouri State University, this survey is being conducted to begin the process bringing industrial needs and educational offering together.

Your efforts and devotion of a few minutes of your busy schedule may have a potential impact on the future development of plastics workers in the state of Missouri. Our concern is that we identify the employment needs and current status of the plastic industry, regardless of the size of operation. To insure the validity and accuracy of the study and to enable us to get a true picture of the plastics industries policies, we need responses from each plastics manufacturer of the state. Please complete and return the survey form. The information you can provide by taking the time to complete this form should be as valuable to you in the plastic industry as it will be to the plastic technology education of Missouri.

I thank you for your interest and valuable assistance in promptly returning the completed form. If you have any questions about the survey, you may call me at 816-429-4439.

Sincerely,

A handwritten signature in cursive script that reads 'Jack M. Landers'.

Jack M. Landers
Project Director